WEEDS TREES & TURF

ONE DOLLAR • JULY 1976

Mr. Sod Retires

Fusarium Blight Symposium

Tree Care Issue

DURSBAN INSECTICIDES

For low cost insect control, use DURSBAN insecticides.

DURSBAN* brand insecticides control over a dozen major turf insect pests—including chinch bugs and sod webworms—more insect control for less money than any other turf insecticide. That's reason enough to use DURSBAN 2E or more concentrated DURSBAN M insecticides in your turf insect control program.

If you want other reasons, consider that DURSBAN insecticides give many weeks of effective insect control. And they are easy to apply.

DURSBAN insecticides mix easily with water. Just mix and spray. They are also available from selected custom formulators as a granule and as a dry fertilizer mixture.

Whether it's for broad-spectrum, effective control . . . or low cost . . . make DURSBAN insecticides part of your turf program now. Just read and follow all label directions and precautions.

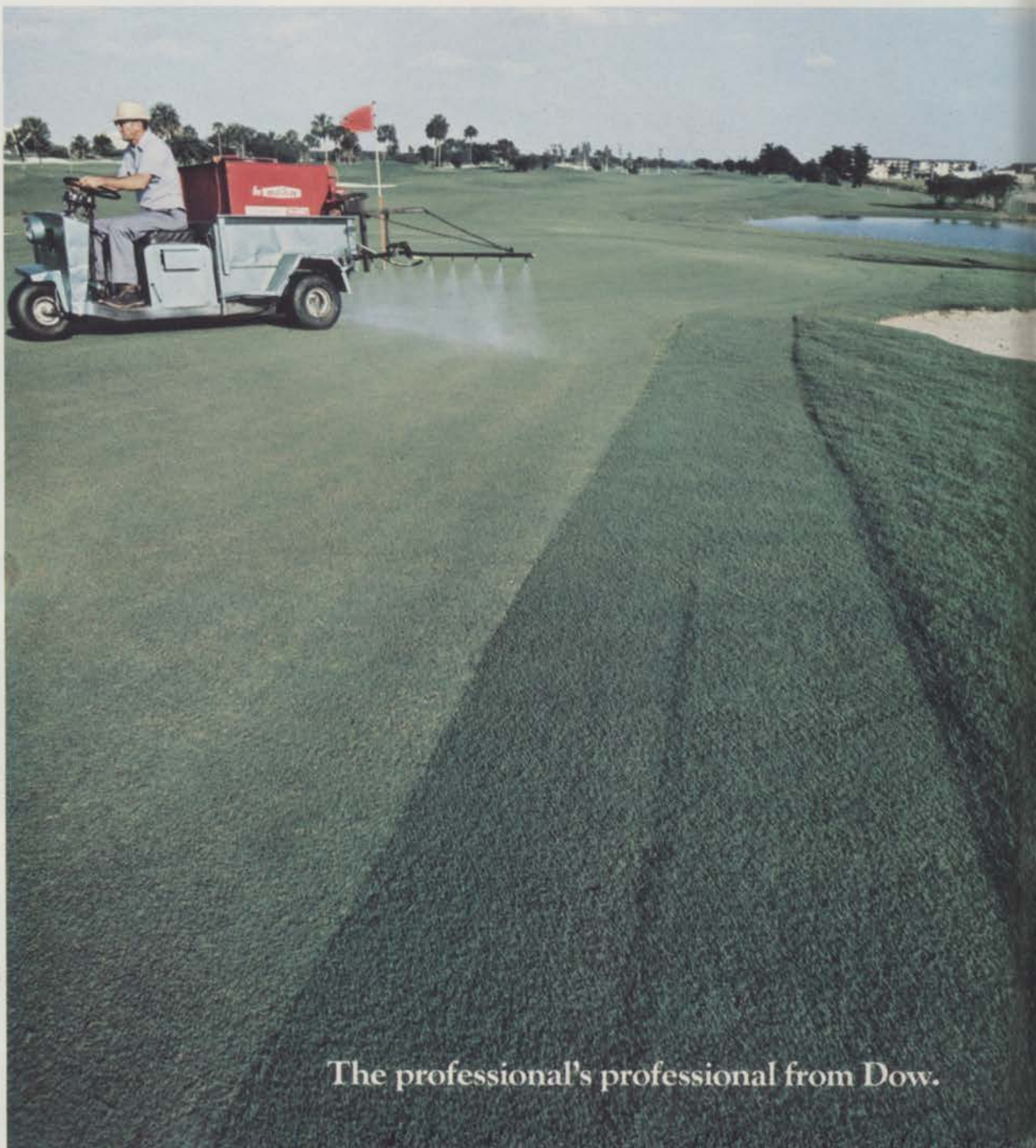
Ag-Organics Department, Midland, Michigan 48640

Circle 106 on free information card

DOW

DOW CHEMICAL U.S.A.

*Trademark of The Dow Chemical Company



The professional's professional from Dow.

WEEDS TREES & TURF®

July 1976, Vol. 15, No. 7

8 Fusarium Blight Symposium — A 14-page symposium on a problem that should be hitting turf managers just about now — Fusarium blight. The symposium includes reports from seven of the top turf people in the country.

12 Mr. Sod Retires — Over 200 persons from all parts of the green industry went to Maryland recently to honor Parker Shirling on his retirement.

17 Traveling Tree Man — A short interview with Bob Felix, executive director of the National Arborist Association. He tells of the dialogue NAA has developed with the regulating federal government.

18 Pine Beetle Battle — Denver suburbanites in mountain valley subdivisions are having monumental problems with the mountain pine beetle. Over $500,000 is being spent on its control.

22 Not A Test Tube Rattler — Dr. John Hall, turf man from the University of Maryland, moved this month to Virginia Polytechnic Institute and State University. He discusses the role of the researcher in the practical and business side of the green industry.

26 Dutch Elm Disease Control — This article presents major aspects of how Dutch elm disease is handled in the National Capital Parks system in Washington D.C.

58 Copper Toxicity on Woody Ornamentals — To aid nurserymen and landscape contractors in identifying copper toxicity on ornamentals, T. Davis Sydnor and Larry Kuhns of Ohio State University ran a series of tests documented by color pictures showing what problems can arise.

Government News 4
Products 48
People 52
Meeting Dates 54
Industry News 60
Classifieds 71
Advertisers Index 71
Trimmings 72

The Cover — Parker Shirling — Mr. Sod — was honored by his peers in the green industry as over 200 persons traveled to Annapolis, Md. for the fete.

Copyright© 1976 by The Harvest Publishing Company, a subsidiary of Harcourt Brace Jovanovich, Inc. Publishers of Pest Control, Weeds Trees & Turf, Golfdom, Pennsylvania Farmer, Ohio Farmer, Michigan Farmer, Missouri Ruralist, Kansas Farmer. Books: Scientific Guide to Pest Control. 9800 Detroit Ave., Cleveland, Ohio 44102.

Member, American Business Press, Business Publications Audit ☆ABP BPA

Single Copy Price: $1.00 for current and all back issues. Foreign $1.50. Subscription Rates: WEEDS TREES AND TURF is mailed free, within the U.S. and possessions and Canada, to qualified persons engaged in the vegetation care industry and related fields in controlled circulation categories. Non-qualified subscriptions in the U.S. and Canada are $10.00 per year; other countries, $12.00 per year. Controlled circulation postage paid at Cleveland, Ohio 44101.

Robert E. Earley, Jr.
Managing Editor

Bruce F. Shank
Associate Editor

Eloise M. Ross
Editorial Assistant

BUSINESS STAFF

Hugh Chronister
President and Publisher

Richard J. W. Foster
General Manager

Paul Baltimore
Operations Director

Jack Schabel
Circulation Manager

Dr. David Harmon
Research Director

Dorothy Lowe
Classified Advertising Manager

EDITORIAL AND ADVERTISING OFFICES

Headquarters: 9800 Detroit Ave., Cleveland, Ohio 44102 (216) 651-5500,

Richard J. W. Foster, National Marketing

East: 757 Third Ave., New York, N.Y. 10017 (212) 421-1350, Russell B. Bandy, Regional Sales Manager

Mid-Atlantic: 9800 Detroit Ave., Cleveland, Ohio 44102 (216) 651-5500, Patrick J. Lamb, Regional Sales Manager

Midwest: 333 N. Michigan Ave., Chicago, Ill. 60611 (312) 236-9425, Jeff Ward, Regional Sales Manager
Tourisse Greenfield (312) 337-7717

West: Graves/Snyder/Sandford, 4311 Wilshire Blvd., Los Angeles, Calif., 90010 (213) 933-8408, William Snyder, Regional Sales Manager

Government News

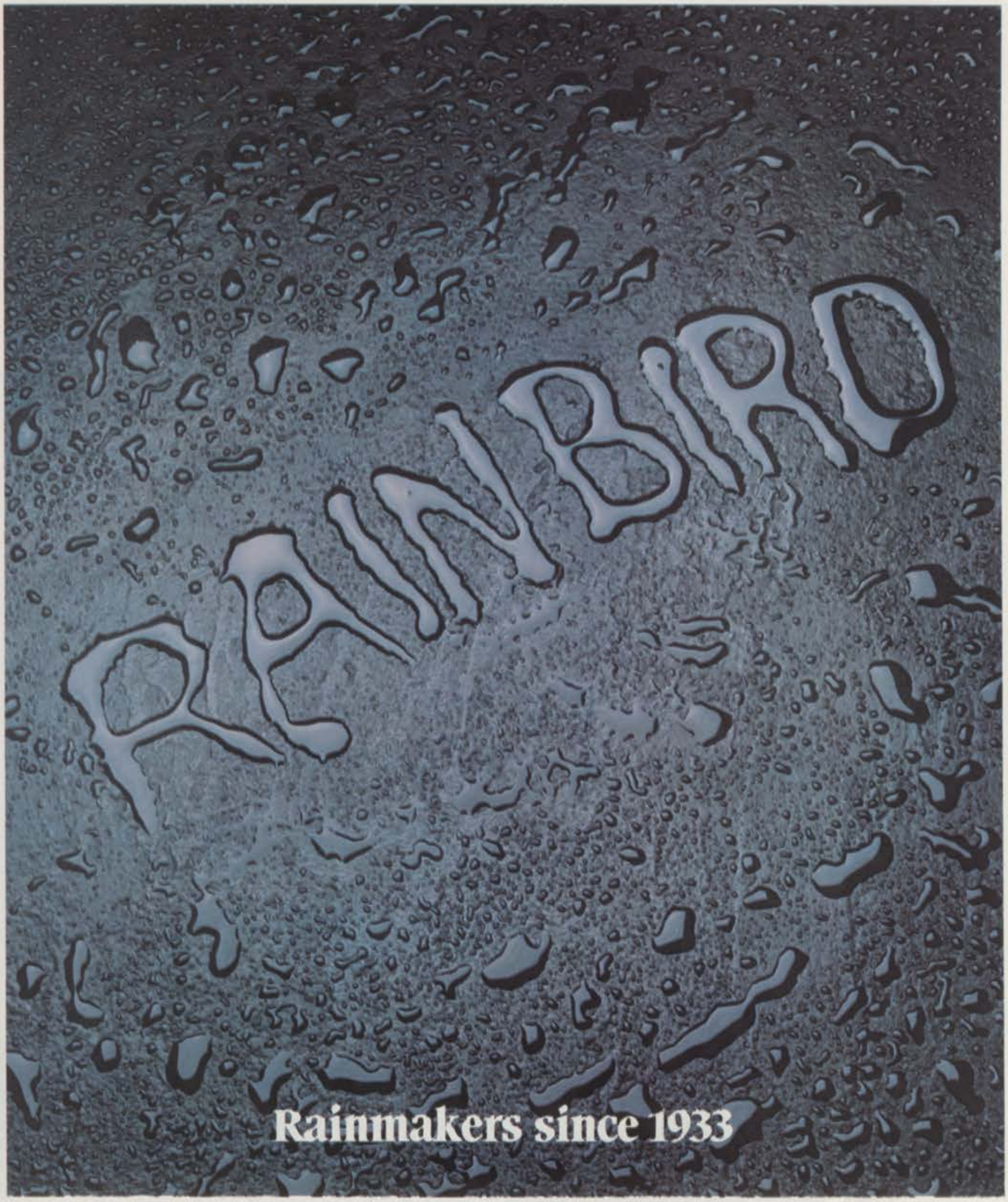
The federal Environmental Protection Agency has approved a new pesticide to treat Dutch elm disease, which is responsible for the deaths of over 400,000 trees every year. The new pesticide, produced by Du Pont Co., Wilmington, Del., is called Lignasan BLP. The company's application for registration of Lignasan was filed with the EPA March 1. Ordinarily, approval of a new pesticide takes five to six months, but EPA administrator Russell Train said, "EPA moved quickly to review this compound because of its importance." The pesticide is injected into the tree trunk just above ground level. While Lignasan is much more effective than other Dutch elm pesticides, it is not a complete cure for the disease, the EPA said. It is effective in preventing Dutch elm disease and usually cures the problem in trees less than five percent damaged.

A new insecticide that interrupts the growth process of the gypsy moth and causes its premature death is now available for use, the U. S. Department of Agriculture has announced. The department said the pesticide, Dimilin, has been registered by the Environmental Protection Agency for use against the gypsy moth, which now infests 11 Northeast states. Dimilin acts on gypsy moths in the caterpillar stage. Normally, when a caterpillar is ready to shed its skin, the body begins to produce chitin, which becomes a part of the insect's outer layer, or shell. Dimilin interferes with chitin production and causes premature death.

Opposition from business groups and the Ford Administration will kill minimum wage legislation for 1976. The gut issue that dooms the bill -- labor's demand for a formula mandating automatic hikes in the wage floor in future years. As it has taken shape so far, the bill would provide not only a minimum wage increase from the current $2.30 an hour to $2.75 but also a formula triggering increases tied to the Bureau of Labor Statistics' index of average hourly earnings.

The federal Environmental Protection Agency's ban on production of pesticides containing mercury for use on golf course greens and seed treatment has been moved to Nov. 30. The decision to delay the ban from June 30 (which was also a delay from earlier in the year) will allow time for courts ruling on several lawsuits filed by mercury producers challenging the EPA's decision. Mercurial pesticides have been linked to nervous-system damage.

The U. S. Tax Court was called upon to decide whether sod is "an exhaustible natural resource" on which depletion deductions can be claimed, or whether producing sod is more akin to farming. Tax law does not permit farmers to claim deductions on exhaustion of farm land. As the Internal Revenue Service saw it, sod is merely "grass to which a certain amount of topsoil adheres." But Meyers Turf Farm persuaded the court that selling sod involves losing "more than a few incidental morsels of topsoil." He said his land could only take 16 cuttings of sod before the topsoil would give out. This steady exhaustion is exactly what depletion is meant to cover, the court decided. It is not known whether the IRS will appeal the decision.



For 42 years, the expert on the green has been Rain Bird. It's the name that has come to mean the most complete line of quality equipment available, backed by the kind of reliability you've come to depend on. And to insure the maximum return on your design, landscape and maintenance investments, we're always standing by with solid service support.

When you won't sacrifice 42 years of quality, leadership and service, call on Rain Bird. Rainmakers since 1933.

RAIN BIRD®
Bringing new ideas to life.

For a full-color Rainmakers poster, write Rain Bird, 7045 N. Grand Avenue, Glendora, CA 91740

Circle 112 on free information card

The Standard.

Turf playability: it's your responsibility. When it's right, you know it. When it's wrong, everyone seems to know it. When a piece of you is on the line, you don't want to leave anything to chance. You want the dependability of proven programs and products: products that set the standard by which others are often compared—products like Acti-dione® turf fungicides. They've set an industry standard during their more than 20 years of continuous use without evidence of fungus resistance. And today, Acti-dione acceptance continues to grow. That's got to be proof of reliability. Shouldn't you, too, join the growing rank of professionals who rely on the standard, Acti-dione turf fungicides?

TUCO

Division of The Upjohn Company

It's what reliable four-season spray programs are built on.

TUCO
Acti-dione®
Thiram
Broad spectrum
Turf fungicide
For Use On: Bentgrass, Bermudagrass, Bluegrass, Fescue, Ryegrass, and St. Augustinegrass
For the Prevention and Control of: Dollarspot, Fading-out, Gray Leafspot, Helminthosporium Leafspot, Large Brown Patch, Melting-Out, Pink Patch, Powdery Mildew, Rust, and Snow Mold.
WARNING!
HARMFUL OR FATAL IF SWALLOWED. KEEP OUT OF REACH OF CHILDREN.
See other warnings on back panel.

The cool, humid weather that encourages the development and growth of dollarspot, leafspot and melting-out in the spring also encourages their spread in the fall. Regular applications of Acti-dione TGF® on tees, greens, and fairways control diseases that are potential problems in autumn.

Pink and Gray Snow Mold organisms thrive under winter weather conditions. Control these diseases with Acti-dione® Thiram. Spray just before the first permanent snow cover and through the winter as thaw allows.

Fungi never have an off-season. They're active year-round. That's why it requires a Four-Season Disease Control Program to keep turf looking beautiful. Build your program around Acti-dione fungicides. They're the standard no matter what season you're in.

Stop turf-damaging insects with the proven insecticide — **PROXOL® 80 SP.**

Circle 129 on free information card

Fusarium Blight

At the Illinois Turfgrass Conference last year, seven top turf people from across the country took part in a symposium on Fusarium blight. According to A. J. Turgeon of the University of Illinois, although there is still much to learn about the problem, this symposium "summarizes our current knowledge on the subject."

Houston B. Couch is a professor in the Department of Plant Pathology and Physiology at Virginia Polytechnic Institute and State University; Herbert B. Cole, Jr. is a professor in the Department of Plant Pathology at Pennsylvania State University; R. E. Partyka is a plant pathologist for the Chem-Lawn Corp., Columbus, Ohio; A. J. Turgeon is assistant professor in the Department of Horticulture at the University of Illinois at Urbana-Champaign; J. M. Vargas, Jr. is associate professor in the Department of Botany and Plant Pathology at Michigan State University; C. Reed Funk is a professor in the Departtment of Soils and Crops at Rutgers University; William A. Meyer is research director for Turf-Seed, Inc., Hubbard, Ore.; and F. H. Berns is research director for Warren's Turf Nursery, Palos Park, Ill.

Fusarium Blight of Turfgrasses — An Overview

by Houston B. Couch

In 1959 a severe foliar blighting was observed on Merion Kentucky bluegrass in southeastern Pennsylvania. The symptom pattern did not fit that of any of the known foliar diseases of turfgrasses, and isolations from diseased leaves only yielded pathogenic organisms that were known to incite symptoms distinct from those observed for the disease in question.

During 1960 and 1961 this same disease was found on Merion Kentucky bluegrass, bentgrasses, and creeping red fescues in eastern Pennsylvania, eastern Ohio, eastern New York, New Jersey, Delaware, Maryland, and the District of Columbia. Beginning in 1960 and continuing through the following three growing seasons, plant and soil samples were collected from the geographic areas that showed the characteristic symptoms of the disease. Isolations from the diseased leaves were attempted in order to determine if pathogenic fungi were present. The soil samples were also checked for the presence of parasitic nematodes. Certain of the soil samples were found to contain parasitic nematodes of the genera *Hoploaimus, Xiphinema, Paratylenchus,* and *Tylenchorhynchus.* In some samples the populations were high enough to produce foliar stress. However, there was no consistency among the samples — neither in the frequency of occurrence of a given genus nor in populations high enough to cause foliar symptoms. Furthermore, many soil samples obtained from turfgrass that showed symptoms of the disease were free from parasitic nematodes. On the basis of this evidence, it was concluded that the disease was not caused by nematodes.

The isolations from diseased leaves consistently yielded two fungus species — *Fusarium roseum* and *Fusarium tricinctum* f. sp. *poae.* Both of these organisms were known to be turfgrass pathogens, but neither had been identified as foliar parasites. *Fusarium roseum* was known to cause a root and crown rot of turfgrasses, while *tricinctum* had been recognized for several years as the cause of "silver top," a disease of turfgrass floral tissue. Pathogenicity tests with isolates of these two fungus species were made on Merion Kentucky bluegrass, Highland bentgrass, and Pennlawn creeping red fescue. While some of the isolates were weakly pathogenic, a very high percentage of those tested incited 100 percent foliar blighting within two to five days from the time of inoculation.

On the basis of (a) consistency of isolation from diseased turfgrass plants over a broad geographic area for several growing seasons, (b) the general lack of consistency of isolation of other microorganisms, and (c) the high degree of pathogenicity of *Fusarium roseum* and *Fusarium tricinctum,* we concluded that these two organisms were the actual incitants of the disease. With further research it was learned that the total syndrome of the disease consisted of two phases — a blighting of the

to page 34

Why TERSAN® fungicides give you Total

LEAF SPOT (Helminthosporium spp.) on bluegrass.

DOLLAR SPOT (Sclerotinia homoeocarpa) on bentgrass.

TYPHULA BLIGHT or Gray Snow Mold (Typhula itoana) on a fairway.

LEAF SPOT on bentgrass (melting-out stage).

LARGE BROWN PATCH (Rhizoctonia solani).

TYPHULA BLIGHT or Gray Snow Mold, close-up view.

RUST (Puccinia graminis) on bluegrass.

FUSARIUM BLIGHT (Fusarium roseum and Fusarium tricinctum).

PYTHIUM BLIGHT or Cottony Blight (Pythium spp.).

TERSAN LSR Turf Fungicide controls Leaf Spot and Rust. It is also effective against Large Brown Patch.

TERSAN 1991 and TERSAN 75 effectively control Dollar Spot and Large Brown Patch. TERSAN 1991 controls Fusarium Blight.

TERSAN SP provides outstanding control of both Typhula Blight and Pythium Blight.

Turf Protection.

You're faced with a lot more than one or two turf disease problems. That's why you need the Du Pont TERSAN program. It gives you protection against just about every disease your course will ever encounter.

But you get more than proven, effective control with the TERSAN program. You get economical control as well. You use just the treatment that works on a given problem. There's no waste. No extra expense. You pay only for the specific treatment to control a specific disease.

And it's more effective. Because you zero in with prescription precision on specific diseases. You use one right treatment applied at the right rate at the right time to achieve the most effective control.

So, if you want to keep your course greener for less money, use the TERSAN turf disease control program. It's the best way to obtain total turf protection against most disease problems. For complete details, contact your chemical supplier—or mail in the coupon.

With any chemical, follow labeling instructions and warnings carefully.

E. I. du Pont de Nemours & Co. (Inc.)
***TERSAN* TURF PRODUCTS**
Room 24933
Wilmington, Delaware 19898

Please send me a copy of your new booklet "How To Keep Your Course Greener for Less Money."

Name_____

Course/Firm_____

Title_____

Address_____

City_____ State_____ Zip_____

DUPONT Turf Products

REG. U.S. PAT. & TM. OFF.

Mrs. Shirling and Eugene Roberts, Fairway Turf Farms

Mr. and Mrs. John Hall, University of Maryland professor

Ray Gustin, Gustin Gardens

Mr. Sod Retires

He taught them what quality sod was. He always had plenty of time to go around for anybody who needed help. He was the father of the sod certification law. He sodded the infamous Watergate complex in Washington. He was the first man in the country to produce certified sod. No matter what he was asked, his motto always was: "I'll be glad to."

Call him "Mr. Sod," "Mr. Grass," or "Mr. Turf."

Parker Shirling.

He came from Missouri to Maryland to start Princeton Turf Farms in 1964 and the first pallet of sod came off the ground in 1965. And they were all there recently to honor him. Over 200 people he had worked with came from all over to the Hilton in Annapolis, Md., to honor him as he announced his retirement at 67.

Eugene Roberts of nearby Fairway Turf Farms gave the toast: "He said we had to have quality sod and sod guidelines to protect the consumer — and it has upgraded the sod producer as well."

Dr. Elwyn E. Deal, assistant director of the University of Maryland Cooperative Extension Service: "There has never been a person more unselfish than Parker; he was always ready to jump in his station wagon and go to a meeting or wherever else he was needed."

Dr. William Mitchell, turf specialist at the University of Delaware: "When we heard Parker was retiring, we took a vote and decided to close the whole place down. Even the grass around Agriculture Hall turned a little bit brown."

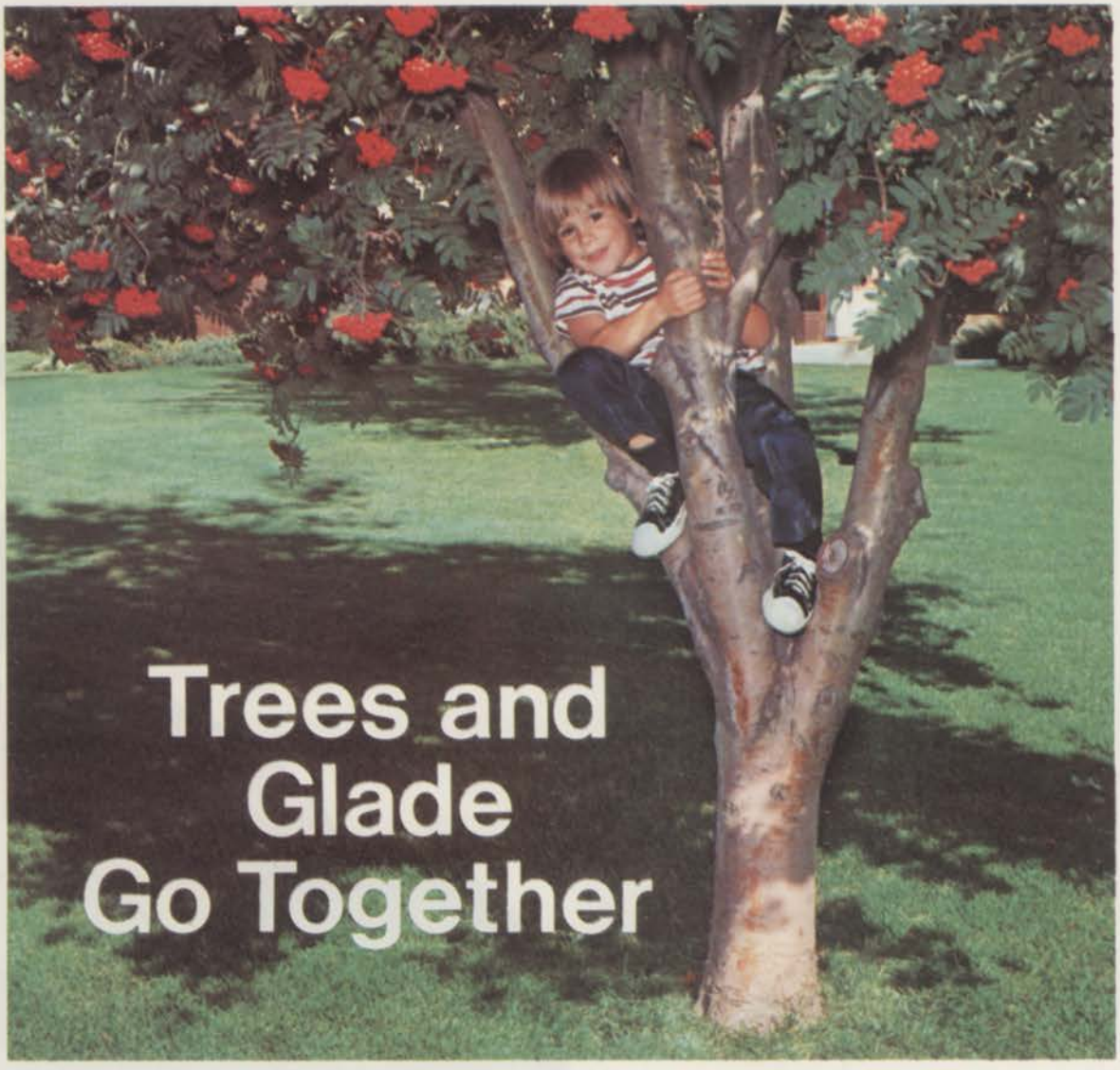
Ray Gustin, Gustin Gardens, representing the Associated Landscaping Contractors of America: "Whenever somebody asked him to do something, he always said 'I'll be glad to.'"

Jim Fisher, representing the Maryland Turfgrass Association: "We've had about 120 meetings since he helped form the association and he has been to about 110 of them. He pioneered quality turf in Maryland and the country."

Jack Kidwell, Kidwell Turf Farms, Culpeper, Va., representing the American Sod Producers Association: "He is the first sod producer to earn honorary membership in ASPA."

Emory Pattin of the Maryland Turfgrass Council: "He made the turf industry sit up and take notice of the changing times; he made the industry better for all of us."

Angelo Cammarota, representing the Mid-Atlantic Association of Golf Course Superintendents: "The greatest tribute to any man is to be accepted by his peers, and that is what is going on here tonight." □



A new natural team, Glade Kentucky bluegrass and trees! Glade performs well in moderate shade, especially when mixed with fine fescues. A selection from Rutgers University (tested as P-29), Glade is an improved, low-growing, medium to dark green grass with fine leaf texture and thick, rapid-growing rhizome and root system. Glade has good resistance to important turfgrass diseases including powdery mildew.

Like boys and trees, Glade and shade go together. Mixed with other elite bluegrasses and fine fescues in moderate shade, Glade is a natural.

Get new Glade at local wholesale seed distributors.

Glade

KENTUCKY BLUEGRASS

U. S. Plant Patent 3151

Another fine product of Jacklin Seed Company

THE 44-INSECT INSECTICIDE.

For trees, ornamentals, and turf.
One solution versus 44 problems. Those are pretty good odds.

Especially since you can't always be sure which insects will threaten the valuable trees, turf and ornamentals you protect. And people enjoy.

This broad-spectrum control with SEVIN® carbaryl insecticide takes some of the chance out of your job.

STOP! ALL PESTICIDES CAN BE HARMFUL TO HEALTH AND THE ENVIRONMENT IF MISUSED. READ THE LABEL CAREFULLY AND USE ONLY AS DIRECTED.

Its versatility also lets you cut down on the need for a large chemical inventory. Why use an array of different brands with different instructions, if you can do the job effectively with a single product? You'll enjoy less nozzle changing, chemical switching and tank flushing. All good reasons to rely on dependable SEVIN.

Use it in any of its available forms to suit your needs - choose from wettable powders, flowables and liquid SEVIMOL® 4.

And SEVIN is compatible with many commonly used fungicides, miticides and other insecticides.

With the increased awareness and concern for protecting the environment, it's nice to know that SEVIN is biodegradable.

And, when compared with many other insecticides, SEVIN ranks low in toxicity to people, animals, birds and fish.

PLANTS	INSECTS CONTROLLED
HERBACEOUS PLANTS carnation, chrysanthemum, gladiolus, iris, peony, zinnia, etc.	blister beetle, boxelder bug, flea beetle, Japanese beetle, June beetle, lace bug, leafhopper, leafroller, mealy bug, plant bug, psyllid, rose aphid, thrips (exposed).
SHRUBS, TREES AND WOODY PLANTS ash arborvitae, azalea, barberry, beech, birch, boxwood, catalpa, cedar, cypress, dogwood, elm, euonymus, ginkgo, hackberry, hawthorn, holly, honeysuckle, hydrangea, juniper, lilac, magnolia, maple, oak, pine, redbud, rose, tulip-tree, etc.	apple aphid, bagworm, birch leaf miner, boxelder bug, boxwood leaf miner, cankerworms, catalpa sphinx, Cooley, Eastern spruce gall aphid, elm leaf aphid, elm leaf beetle, elm spanworm, eriophyid mites, gypsy moth, Japanese beetle, June beetle, lace bugs, leafhopper, leafroller, mealy bug, oak leaf miner, orange tortrix, periodical cicada, pine sawfly, puss caterpillar, plant bug, rose aphid, roseslug, scale, spruce gall aphid.
LAWNS, TURF	ants, chinch bugs, cutworms, earwigs, fall armyworm, fleas, leafhoppers, millipedes, mosquitoes, sod webworms (lawn moths).

NOTE: SEVIN will injure Boston Ivy, Virginia Creeper, and Maidenhair fern.

Make a quick check of the plants and insects for which SEVIN carbaryl is registered. See how many problems it can solve for you.

Then ask your chemicals supplier about SEVIN - the insecticide with over 18 years' experience in effective pest control.

SEVIN® UNION CARBIDE
CARBARYL INSECTICIDE

18 BAD YEARS FOR BAD INSECTS.

SEVIN and SEVIMOL are registered trademarks of the Union Carbide Corporation for carbaryl insecticide.
Union Carbide Corporation, Agricultural Products and Services, P.O. Box 1906, Salinas, CA 93901.

PRO4 Diamond Shamrock

DACONIL 2787® pours it to nine fungus diseases

Broad spectrum Daconil 2787 fungicide controls nearly all of the fungus diseases found on golf greens, tees and fairways, as well as many ornamentals.

And now it is available in convenient flowable or wettable powder form.

Excellent turf tolerance permits use right on through the hot, summer months. Used successfully on over 25 species of grass . . . established turf or new seedings. Daconil 2787 is highly effective against *Helminthosporium* in the spring and fall.

For professional turf care over your entire golf course, follow the Diamond Shamrock Pro-4 system: Daconil 2787 fungicide, DACTHAL® preemergence herbicide, DACAMINE® and DACONATE 6® postemergence herbicides. You'll see beautiful results.

Contact your turf chemicals supplier, or write the Diamond Shamrock sales office nearest you.

Diamond Shamrock
AGRICULTURAL CHEMICALS DIVISION

SALES OFFICES: • 1100 Superior Ave., Cleveland, Ohio 44114 • 1401 W. Paces Ferry Rd. NW, Atlanta, Georgia 30327 • 1006 Main St., Houston, Texas 77002 • Commerce Plaza Building, 2015 Spring Rd., Oak Brook, Illinois 60521 • 617 Veterans Blvd., Redwood City, California 94063

 Circle 118 on free information card

Arborists' Bob Felix

Traveling Tree Man

'We have been recognized by government as a spokesman for the tree care industry; this dialogue is very important'

Bob Felix, executive secretary of the National Arborist Association, is a one-man, traveling tree show. If you need to know something about the tree care industry, he probably has the pertinent and most up-to-date information right there in his briefcase, or he probably talked to the number one person in that subject area within the last week either by phone or in person.

He is straight and to the point, and you know where he is coming from after 21 years in the tree care business before becoming executive secretary of NAA. He is excited about the tree business and where it is headed in this bicentennial year, and he stopped by offices of WEEDS TREES & TURF a few weeks ago to talk about what NAA is doing and where it is going.

"We have established a working relationship with the Environmental Protection Agency and the Occupational Safety Health Administration," he said. "NAA has been recognized as a spokesman for the shade tree industry, and this dialogue is very important. It enables the industry to have a voice in forthcoming regulations from Washington and on state levels."

The same day Felix said this, he had spent the morning in Washington with other NAA members with EPA officials discussing two issues — tank mixing; and mixing like insecticides when all the same pests are not named on both labels. Favorable rulings are expected, but whatever the final formal disposition, the NAA and the tree care industry were represented in the decision.

The NAA is also developing a 22-cassette training program for the entire tree care industry, not just NAA members. Areas touched on in the training program are cabling, plant pathology, soils, fertilization, spraying, tree removal, identification and effects of pollution on trees. "The purpose here is to give the tree care industry diagnostic and practical tools to help companies and their workers do their job better," Felix said.

Felix is very excited about the new management and technical seminars being developed for tree care companies by NAA. The first management seminar was held last month in Chicago with very good response.

The committee structure of NAA is strong. Its utility committee is working on developing a forum for exposing common problems of utility tree trimming. The standard practices committee is revising and determining new needs for additional standards of the industry. The safety committee is preparing slide programs on the correct and safe way to carry out tree care work to be shown to employes.

The NAA has participated in and is supporting shade tree evaluation guideline (see May issue). Also, the bicentennial tree program being pushed by NAA is a way to put arborists on the map and get recognition for the tree industry. "After all," Felix said, "trees are the only living witness to the Revolution."

Audiometric testing standards to come down from OSHA is another area that will be in the news in months to come. "What are chipper and chain saw companies doing about these impending standards?" Felix asked. "What kind of impact will there be?

"Our long-range goal is to increase our membership by becoming broader in some areas, enlarge our relationship with EPA, OSHA, and other government agencies, and pursue our relationship with other organizations and associations in the green industry," he said. □

Pine Beetle Battle in Denver

Residents of mountain areas must learn to manage the forest, or give in to the mountain pine beetle.

The many Denver people who fled the hectic life during the last five or 10 years in favor of the slower and more relaxed pace in new mountain homes forgot to ask about one of their neighbors— the mountain pine beetle.

When hundreds and thousands of people moved up into their new homes in mountain valley subdivisions or onto their two or five acres further on up, they brought many changes with them. Along with the new homes came better fire protection. And because of that, trees are now growing where they've never grown before in such numbers.

Also new homes and roads rerouted runoff and isolated trees from their normal supplies of water and nutrients. Other roads were packed down over tree roots. Many trees had much of their root systems severed. And with such an increase in tree numbers, the competition between them weakened them all.

Weakened and overcrowded trees are most susceptible to mountain pine beetle destruction, so man created a situation that was ripe for a full-blown beetle infestation. And that's exactly what developed.

Drive up through those residential areas today and you'll see mountain sides checkered with pockets of beetle-killed ponderosa pine. The problem is especially serious in residential and recreational areas because the trees there are worth considerably more than if they were in a remote commercial forest.

Because they are in residential and other developed areas, the International Society of Arboriculture says each tree is worth up to $10 for every inch in diameter. That's an investment homeowners can't afford to overlook.

USDA entomologist Bob Averill working in Roosevelt National Forest outside Boulder, Colo. ties a log infested with mountain pine beetles to a healthy, uninfested tree. The tree will become infested, then will be sprayed to enable researchers to study effectiveness of insecticides, spraying equipment and spraying techniques.

What's being done to stop the beetle? The state of Colorado, along with the U.S. Dept. of Agriculture (USDA), is spending about a half million dollars each year on suppression. Colorado itself had an active control program underway. In that program, infested trees are cut down, stacked in the sun and covered with plastic tarps, then fumigated with ethylene dibromide (EDB) — one of two chemicals labeled for use on the pine beetle, says Ken Lister, a USDA Forest Service entomologist in Denver.

Lister, along with Bob Averill, another USDA entomologist, are both involved with USDA projects aimed at controlling the threatening pest. Presently they are working with a formulation of Sevimol 4 carbaryl insecticide. Called "Pine Tree And Ornamental Spray," the product is formulated and distributed by Balcom Chemical Company in Greeley. Balcom, an agricultural chemical distributor, has a Colorado state registration for use of the material as a preventive spray to control pine beetle. It is the only product currently registered for such use. Union Carbide, Salinas, Calif., manufacturer of Sevimol, hopes to have the insecticide federally registered for control of mountain pine beetle in the near future.

Lindane is also being used against the beetle. It is applied to infested trees as the beetles are leaving them but before they can reach and kill another tree. But both lindane and EDB are being used for direct control. Neither of them are registered for use as a preventive spray for mountain pine beetle. Outside of work by government agencies, homeowners themselves also are actively involved in trying to stop the spread of the mountain pine beetle. A number of forestry cooperatives have sprung up in these new residential areas. And many of these coops are also getting federal-state cost sharing assistance — from 30 to 50 percent of the cost of control being repaid.

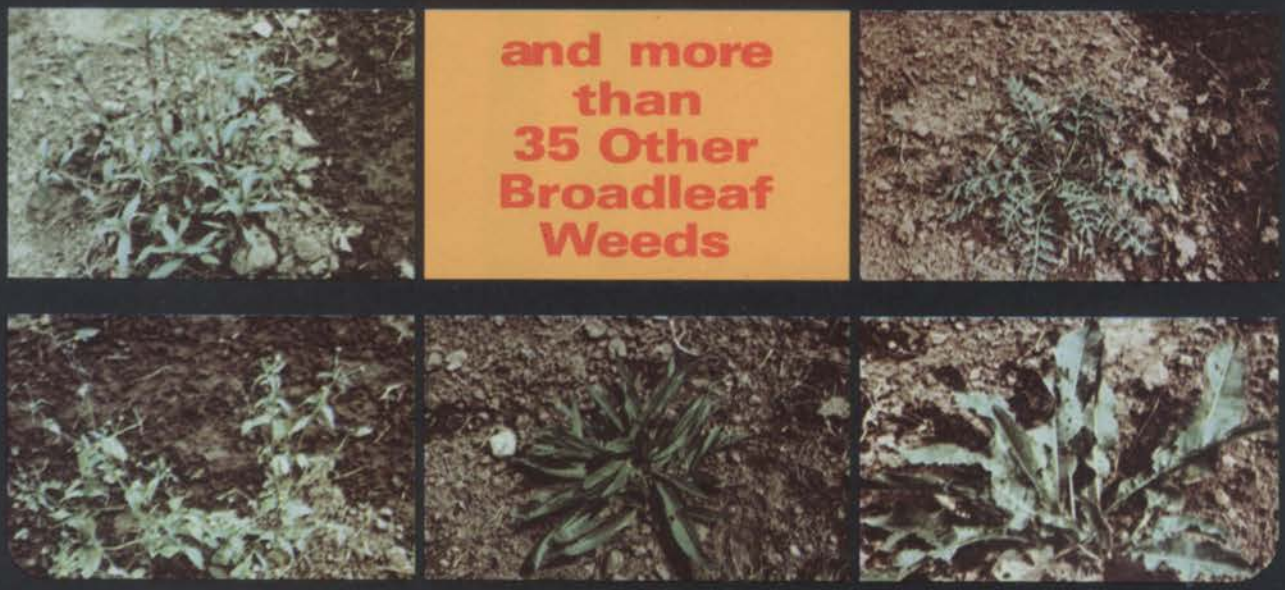
But Lister points out that much of the beetle problem could be solved by forest management. "If a

APPLY MALLINCKRODT TREX-SAN™

Brand Broad-Spectrum SYSTEMIC Broadleaf Herbicide

ONCE-

RID YOUR TURF OF...



MOST EFFECTIVE SAFE HERBICIDE

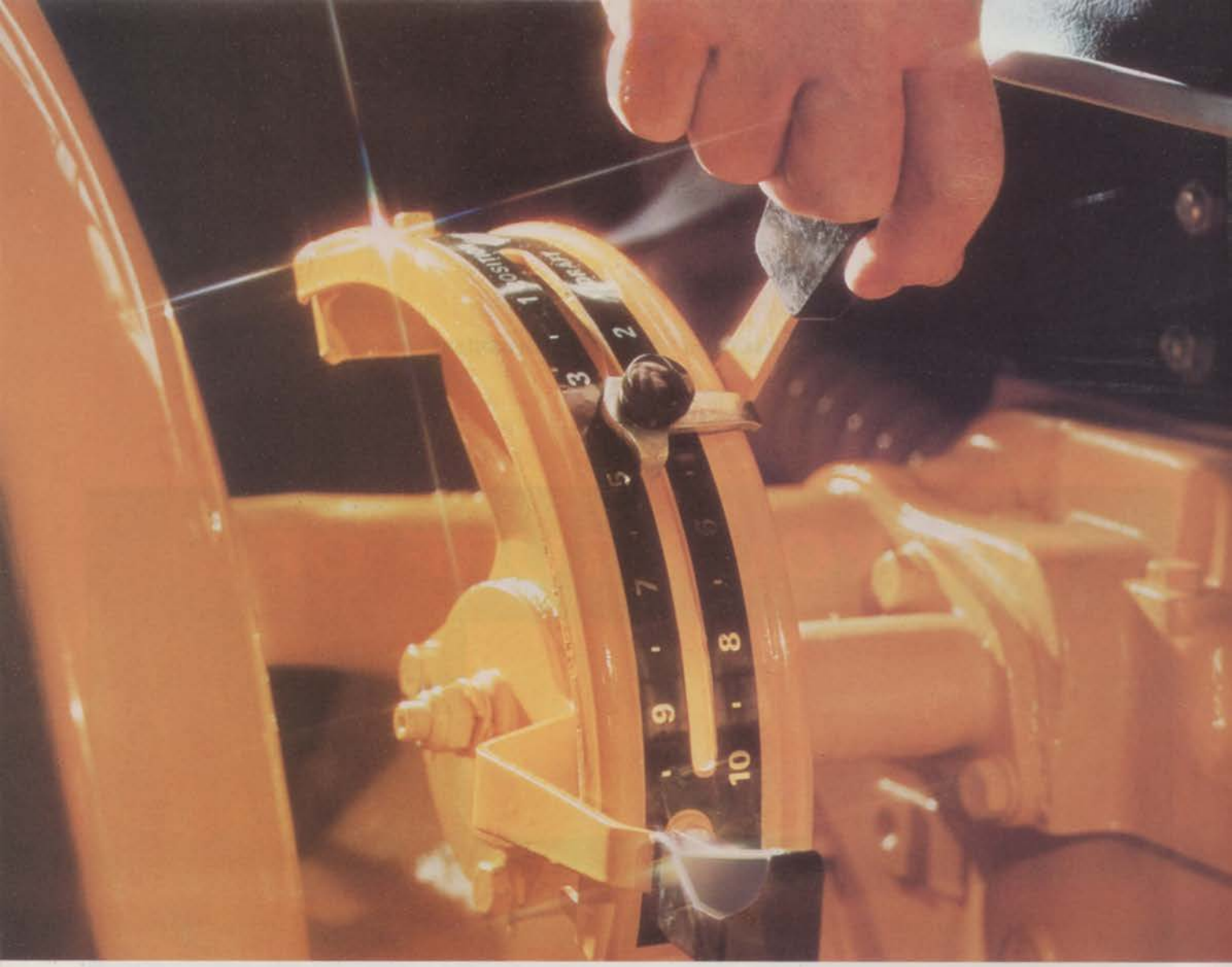
One early application of Broad-Spectrum TREX-SAN™ will kill the weeds that plague you now, thus also preventing their seeding and re-appearance next year. TREX-SAN combines the unique weed-killing properties of 2,4-D, MCPP and DICAMBA — their synergistic action in TREX-SAN provides the safest, most effective single herbicide known. We've seldom found a broadleaf weed TREX-SAN won't control. Yet it provides an extra tolerance of safety to fine turf and ornamental plantings when applied as directed. A single gallon of TREX-SAN treats *four full acres* to save you *money* . . . Single applications in spring and fall save you *time* . . . in achieving complete weed control. Order TREX-SAN from your Mallinckrodt distributor today.

Mallinckrodt®

MALLINCKRODT INC.

ST. LOUIS

Jersey City • Los Angeles • Montreal



New precision!

New Ford hydraulic lift system offers precision control for landscaping and other soil preparation work.

Equipment responds smoothly and accurately with fine increments of adjustment. Versatile Ford 2-lever control system allows three types of response:

1. Position control
2. Draft control
3. Position and draft control working together to limit maximum depth of equipment in widely varying soil conditions.

With 8.5-gpm hydraulic pump, you get fast, positive action for remote hydraulics, side-mounted cutterbar mowers, utility loaders and other equipment.

The precision 2-lever hydraulic control and 8.5-gpm pump are standard equipment on Ford 32-52 PTO horsepower all-purpose tractors; optional on other Ford 3-cylinder tractors (except orchard, vineyard).

See your Ford tractor and equipment dealer soon for information on how to buy, lease, rent or finance. He's listed in the Yellow Pages under "Tractor Dealers".

FORD TRACTORS

Ford

Circle 139 on free information card

Pine Beetle Battle *continued*

lot of these people had taken out half of their trees, they might not have had an outbreak in the first place." Averill adds that "there are very few forestry consultants in this area. The same is true for custom applicators who are equipped to do such work as applying preventive sprays. There's plenty of room for expansion here," he says.

The fact that homeowners are plenty concerned about the pine beetle was illustrated last summer when a large number of residents drove all the way from Denver or Boulder to Greeley — about 50 miles one way — to obtain one or two gallons of Balcom's "Pine Tree And Ornamental Spray" insecticide. The entomologists say most of these homeowners were applying the preventive spray themselves with small hand sprayers.

"And while they might not have been getting the chemical up as high as they needed to, they were probably getting it up high enough to catch most of the beetles," Averill says. Averill says that homeowners should be saturating the trunk of the tree to a height of about 30 feet. "They need to spray the trunks of trees because that's where the beetle actually enters the tree," he says.

He points out that the two types of sprayers he and Lister have been using in their work — the mist blower and hydraulic pump — perform equally as well. But he also adds that the mist blower has a definite advantage in portability because of a backpack model which is available for less than $500.

The spray should be applied during the first half of July — just before the mature beetles emerge from trees they killed last summer to move to live healthy trees to repeat their deadly life cycle. The female beetle first bores into the ponderosa pine — the main tree species on the front slope of the Rockies — then starts boring out vertical galleries where she then lays her eggs. After they hatch, the young larvae start boring out horizontal galleries.

"It's this physical girdling of the tree that kills it. It takes from only 500 to 1,000 beetles to kill a pine," Lister says. The beetles also can introduce a bluestaining fungus which is capable of killing the trees," Averill says. The fungus is injected into the tree by the salivary secretions of the beetle.

Mid-July to mid-September is when the beetles are attacking new trees. Even though the tree is usually killed within a matter of weeks, it isn't until the next spring that the needles actually start turning brown. The two USDA entomologists say that if these trees are cut down and burned or cut up for firewood, it helps break the beetle's life cycle.

But they point out that eradication is pretty much out of the question. "We have such a large scale infestation going on that there just isn't that many dollars or that much time and interested people available to even try an eradication program," Averill says. "In Colorado alone, we have more than a million infested trees." And even if there were funds and time available to launch an eradication program, it still wouldn't be feasible on large commercial timberlands. "The current price of timber won't justify it," Lister says.

"The cost of the preventive spray will run about 75 cents a tree," he adds. That might not seem like much if you're treating 20 or 30 trees. But when you start talking about 20,000 acres, you're talking about thousands of dollars.

Averill points out, however, that homeowners don't need to apply preventive sprays to every one of their trees. "What they really need to do is sit down with someone who knows what trees have been weakened by roads, homes and other construction. Then they need to identify the trees they want to save. Those trees are the ones I'd treat with a preventive spray," he says. He adds that they have to be sprayed every year until the infestation outbreak subsides. "The homeowner can then take a chance on the other trees or he can cut them down himself," Averill continues.

He concludes by saying that if we don't manage the forest, then insects, disease or fire will do it for us. And he adds that as more people move up into the mountains around Denver it will mean more problems. And that puts even more importance on forest management and preventive spraying. □

The new Fords...

Now, 16 new Ford grounds maintenance power units. Tractor-loaders, low center-of-gravity tractors, all-purpose and utility models.

See them now!

Circle 167 on free information card

Dr. John Hall Moves from Maryland to VPI

Not A Test Tube Rattler

Dr. John Hall, noted for his turfgrass work the last few years at the University of Maryland, this month moved his base of operations to Virginia Polytechnic Institute and State University in Blacksburg. He is turfgrass extension specialist replacing Dr. A. J. Powell, who recently moved to the University of Kentucky.

Dr. Hall is one of the most active turf researchers around when it comes to working with all aspects of the turf industry. "I don't see how a researcher could operate if he did not communicate closely with the industry," he told WEEDS TREES & TURF late one afternoon recently in his office at College Park. "Practical research is still the most prevalent in the turf industry because we are still in our infancy. Few universities can afford to do basic research for the stage we are in now."

To spend time "rattling test tubes", as he calls it, would probably alienate much of the practical side of the industry, he said. When he came to Maryland four years ago, he began building the turf program with his colleagues from this practical approach, evaluating herbicides to advise people in the field and heavy testing in management and variety trials.

He works closely with golf course superintendents, sod producers and other green industry associations in his area, and said "it is absolutely essential to get involved because only in association meetings and industry contacts can you find out on what to emphasize research." Turf people give up their land and maintain much of the areas after researchers like Hall do initial work.

"For example," he said, "we have not had *Fusarium* blight on our research farm since I have been here, so I have had to go out to the people I have met in the associations to work on it."

'I don't see how a researcher could operate if he did not communicate closely with the industry.'

He said he tried to stay on the fence when he first came to Maryland, not wanting to make any recommendations or step on anybody's toes, but has learned that by taking stands and giving opinions is where the real service to the industry can be done. "I tried to put out too many fires when I first came here too," he said, "helping people with very real but still singular problems they were having. But I have found out that with the limited time we all have here that the best thing we can do is things like develop educational programs for a larger number of people, write articles on the work we are involved in, and put out mimeos and data sheets on variety testing and things like that."

He said manufacturers and other companies in the industry are also a tremendous help. They are doing more basic research on herbicides and fungicides, and he feels it is absolutely essential to maintain a close relationship with them. "The universities have the reputation that is respected in the industry," he said, "and we do the field testing with the products after the manufacturer does all of the ground work to come up with something he feels will be useful."

The companies make direct contact with researchers like Hall to do studies on the products they develop, and he feels this is a good system. The contact is usually on an individual basis with technical representatives from the various companies.

"I have enjoyed the University of Maryland immensely, and I have enjoyed the people I worked with both in the university and in the field," he said. "It has also been good for me personally because working in the transition zone has enabled me to see both warm and cool season grasses, and insects and diseases you can only see in the transition zone." □

BROUWER

A WORLDWIDE NAME IN SOD HARVESTING EQUIPMENT

SAYS G. G. BEDER, BOX 70, BEETON, ONTARIO:

"3 men recently cut and palletized, 20,690 square yards of Sod in 10 working hours with "ONE" Brouwer Sod Harvester."

NO WONDER WE HAVE 85% OF THE SOD HARVESTER MARKET

THE BROUWER HARVESTER WILL ROLL, SLAB or FOLD 15", 16" - 18" and 24" SOD FASTER THAN ANY OTHER MACHINE AND CAN USE 48", 54", 56" and 60" PALLETS

THE SIMPLEST — MOST DEPENDABLE — LOWEST COST — MOST PRODUCTIVE

SEE US AT THE A.S.P.A. FIELD DAY, AT THE TUCKAHOE FARM NEWPORT, RHODE ISLAND, JULY 21 - 23.

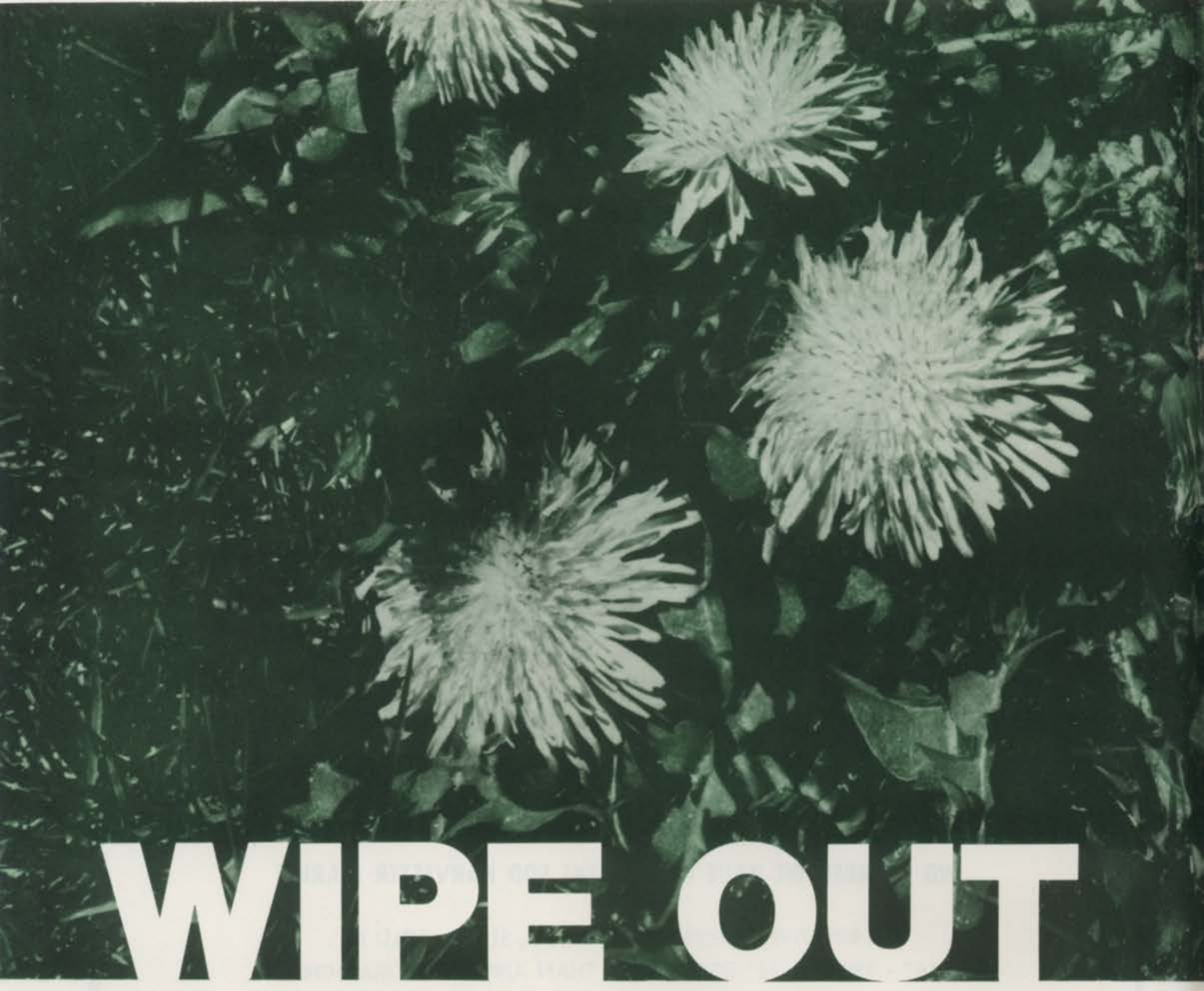
BROUWER TURF EQUIPMENT LIMITED

R.R. No. 1, KESWICK, ONTARIO

L4P 3C8

Phone: (416) 476-4311

Circle 140 on free information card



WIPE OUT WITH BANVEL® 4S...

Banvel herbicides are broadleaf weed "specialists" designed for professional turf programs.

As a professional turf man you have a reputation to be proud of. And, rightly so! Your skill, knowledge and effort shows in the beauty and quality of your turf. So why take chances with understrength herbicides? Herbicides that get some broadleaf weeds but leave you with repeated deep-rooted problems—such as dandelions and plantain. Banvel 4S and Banvel +2,4D control all the major broadleaf weeds, and most of the time with just one application. Check the chart and compare your weed problems with the herbicides available.

Here's why Banvel herbicides are the professionals' choice for weed control

- When used as directed Banvel will not harm trees, ornamentals or grass—it just eliminates weeds.
- No season restrictions. Lay down Banvel from early spring to late fall—all through the growing season.
- Rain will not affect Banvel. It keeps working because it translocates—penetrates leaves and is absorbed through roots to attack every part of the weed.
- Banvel is not a soil sterilant. There is no residual reaction from Banvel as it is broken down in the soil by bacterial action. It is biodegradable.
- No special spraying equipment necessary. It is easy to clean out of equipment after use.
- Mixes readily with hard or soft water.
- Easily stored through winter months without losing potency.

WEEDS

BANVEL®+2,4D

herbicides...

Herbicide and Broadleaf Weed Susceptibility

Weed	2,4-D	Silvex	Meco-prop	Dicamba
Bindweed	S	S-I	S-I	S
Bittercress	S	S-I	S-I	S
Black medic	R	S-I	I	S
Buttercup	S-I	I	I	S
Carpetweed	S	S	S	S
Chickweed, common	R	S	S-I	S
Mouse-ear	I-R	S	S-I	S
Chicory	S	S	S	S
Clover, crimson	S	S	S	S
Hop	I	S	S	S
White	I	S	S	S
Cranesbill	S	S-I	S-I	S
Daisy, oxeye	I	I	I	I
Dandelion	S	S	S	S
Dock	I	I-R	I-R	S
Dogfennel	I	S	I	S
Garlic, wild	S-I	R	R	S-I
Ground ivy	I-R	S-I	I	S-I
Hawkweed	S-I	R	R	S-I
Henbit	I	S	I	S
Knapweed, spotted	I	S-I	I	S
Knawel	R	S	I	S
Knotweed	R	I	I	S
Lambsquarter	S	S	S	S
Lespedeza	I-R	S	S	S
Mugwort	I	I-R	I-R	S-I
Mustards	S	S-I	I	S
Nutsedge	I	R	R	R
Onion, wild	I	R	R	S-I
Ornamental plants	S-I	S-I	S-I	S
Woodsorrel	R	S	R	I
Pennycress	S	S-I	I	S
Pepperweed	S	S-I	S-I	S
Pigweed	S	S	S	S
Plantains	S	I	I-R	I-R
Poison ivy	I	S	R	S-I
Pony foot	S	I	I	S-I
Prostrate spurge	I	I	I	S
Purslane	I	S-I	R	S
Red sorrel	R	I	R	S
Shepherdspurse	S	S	S-I	S
Speedwell	I-R	I-R	I-R	I-R
Spotted spurge	I-R	I	S-I	S-I
Thistle, musk, curl	S	I	I	S
Thistle, Canada	I	I	I	S
Vegetables	S	S	S	S
Wild carrot	S	S-I	S-I	S
Wild strawberry	R	I	R	S-I
Yarrow	I	I-R	I-R	S
Yellow rocket	S-I	I	I	S-I

S = weed susceptible; I = intermediate, good control at times with high rates, sometimes poor, usually require more than one treatment; R = resistant weeds in most instances.

Chart reprinted by permission, S. Wayne Bingham, Ph. D.

"Two" is better!

Some weeds simply aren't affected by single herbicide treatment. But Banvel +2,4D has an "additive effect" in that the two herbicides get weeds that one alone just weakens.

Banvel herbicides—products for professional turf men

Velsicol®

Velsicol Chemical Corporation
341 East Ohio Street • Chicago, Ill. 60611

© Velsicol Chemical Corporation. 1976

WTT-776

Circle 123 on free information card

HOW NATIONAL CAPITAL PARKS CONTROL DUTCH ELM DISEASE

by James L. Sherald
Richard S. Hammerschlag
National Park Service

Despite the constant threat from Dutch elm disease (DED), the elm continues to play the dominant role in the landscape of the Federal Enclave of our nation's capital. Over twenty-five hundred elms lend a graceful and majestic flavor to the streets, parks, monuments and buildings of one of the world's most significant park areas.

The successful perpetuation of our national elms has not been without a tremendous investment of time and effort. At a time when elms throughout the northeast and midwest were being devastated by DED, the National Capital Parks (NCP) took immediate action to maintain and preserve this elm resource. Successful elm management has been achieved through the conscientious implementation of an expanding, comprehensive, integrated control program. The purpose of this article is to outline the various facets of our current DED program which are being used to sustain one of our country's few remaining elm populations.

American elms lining 14th Street near the Washington Monument.

American elms surrounding the Tidal Basin and the Jefferson Memorial.

Within the Washington, D.C. area, the European elm bark beetle is the common vector of the fungus *Ceratocystic ulmi* (Buism.) C. Moreau, the causal agent of DED. The beetle vector has always been considered the most readily controlled factor in the disease cycle. In the early years of the DED control program, NCP like many other municipalities, applied DDT in late winter or early spring to protect twig crotches from bark beetle feeding and the concurrent inoculation with the disease organism. The publishing of Rachel Carson's Silent Spring and the revelation of the persistent and hazardous nature of DDT resulted in the introduction of methoxychlor, another insecticide which is less persistent and therefore less hazardous to the environment. Thus NCP, as well as most other organizations involved in DED control, relies extensively on the thorough application of a dormant methoxychlor/xylene spray for bark beetle control.

Although a dormant spray may effectively minimize bark beetle feeding, the key to long-term beetle control is a thorough sanitation program. The European elm bark beetle seeks weakened or dying elm wood to breed in. Sanitation involves efficient detection, rapid removal, and destruction of these diseased or dying limbs and trees to eliminate the favored beetle breeding sites. By limiting beetle reproduction, spread of the fungus to other trees is lessened.

Recently the Forest Service and the State University of New York College of Environmental Science and Forestry have made advances in the biological control of bark beetles through pheromone (attractant) trapping thereby offering a new prospect for beetle suppression. The Ecological Services Laboratory

to page 30

Take a knife to your grass. You may find it's choking itself.

Take a knife and cut out a small section of turf. Then take a look at the brown, dead material over the top of the soil around the blades of grass. This is thatch. And it may be choking your grass.

A small amount of thatch is desirable to protect tender shoots from the sun and hold moisture in the soil. But if you have more than a one-half inch build-up, it can keep air, water, and fertilizer from reaching the root zone.

That's when you need the Ryan Ren-O-Thin IV. Its 7-hp engine easily handles deeply embedded thatch. The floating front axle keeps the blade height even and the spring-loaded reel clutch control on the handlebar gives you fingertip control.

The Ren-O-Thin IV not only dethatches, it also thins running stem grasses, cuts out low-growing weeds, and leaves tiny slits to trap water and fertilizer. And it *catches* what it rakes in a 6-bushel catcher attachment. So dethatching is a once-over job.

Take a knife to your grass. And if you've got a thatch problem, give your turf room to breathe with the Ren-O-Thin IV.

Write for your Ryan catalog today.

RYAN®
TURF-CARE EQUIPMENT

OMC-Lincoln,
a Division of Outboard
Marine Corporation,
6529 Cushman Drive,
P.O. Box 82409,
Lincoln, NB 68501

Diazinon. The one broad-spectrum turf insecticide with the label to prove it.

The surest way to control the most turf insects, with one insecticide, is to spray the one that's labelled for the most insects. That insecticide is Diazinon.® The one broad-spectrum turf insecticide. With the label to prove it.

Controls 21 turf insects. More than all the other common turf insecticides combined.

Insects	Rate per 1,000 sq. ft.		Remarks
	Diazinon AG500	Water	
Lawn Chinch Bugs	2-3 fl. oz. or 3-6 fl. oz.	25 gals.*	Use higher rate for longer residual control and in lawns of dense growth, such as St. Augustine lawns.
Ants, Armyworms, Clover mites, Springtails (Collembola), Crickets, Cutworms, Digger wasps, Earwigs, Frit flies, Lawn billbugs, Sod webworms (Lawn moth), Sowbugs, White Grubs (such as Japanese Beetle larva)	4 fl. oz.	3 gals.	Spot spray anthills and wasp ground nest openings. For lawn billbugs and grubs, irrigate the lawn thoroughly immediately after treatment. For frit flies, mow grass and water well before treatment but delay application until grass is dry. Do not water again until necessary.
Brown dog ticks, Bermuda mites, Chiggers, Fleas, Leafhoppers	1¼ fl. oz.	3 gals.	Do not apply to animals. For brown dog ticks spray grass and under shrubbery, particularly near house.
Millipedes	8 fl. oz.	3 gals.	
Rhodesgrass Scales	5 fl. oz.	25 gals.*	Apply when crawlers first emerge.

*Application may be made in 3 gals. of water per 1,000 sq. ft. Thoroughly water treated area immediately following application.

Bear in mind, the actual label has a lot more information you need to know.

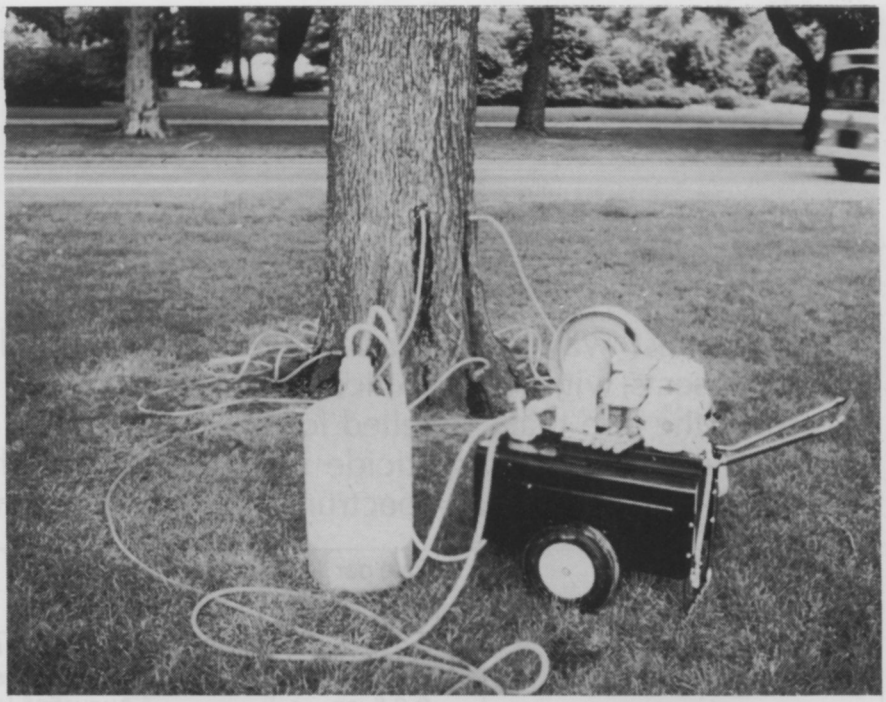
If you'd like to have a copy of the complete Diazinon AG500 or 4E label, pick up one from your local supplier. Or write us.

Agricultural Division, CIBA-GEIGY Corporation, P.O. Box 11422, Greensboro, NC 27409

Diazinon

DUTCH ELM DISEASE

continued

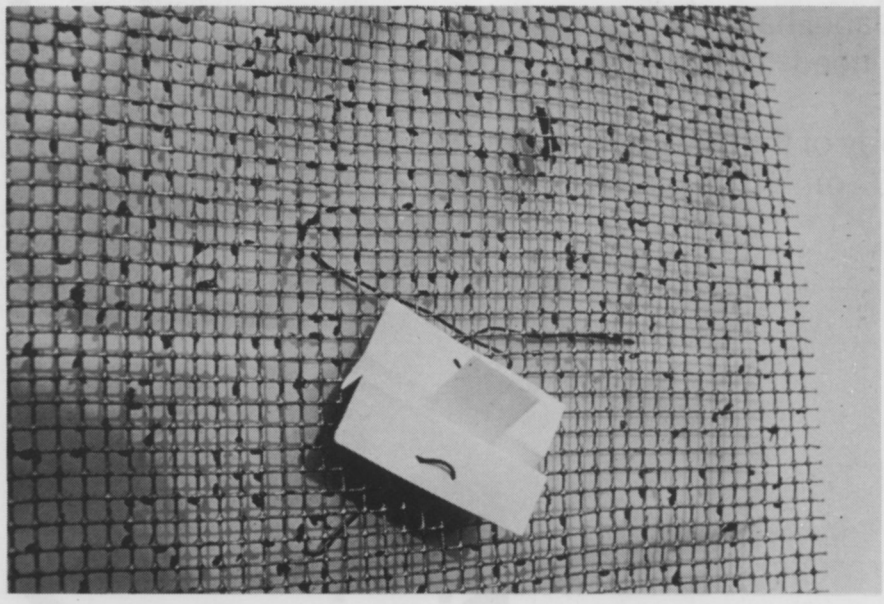


Power sprayer injection apparatus for treatment.

(ESL) and the USDA Northeastern Forest Experiment Station, Delaware, Ohio, are currently using pheromone traps in NCP. A number of traps consisting of hardware cloth coated with Stikem Special® and baited with dispensers containing the synthetic pheromone combination, Multilure, have been installed throughout the Park to survey the beetle population. Such widely spaced survey traps have been helpful in indicating areas of high beetle density. Emergence periods, which usually occur twice throughout the summer, can also be accurately monitored through weekly beetle counts of survey traps. Emergence monitoring may be useful for timing cover sprays to the beginning of emergence periods. Ultimately mass beetle trapping may prove to be an effective procedure for reducing DED.

The earlier diseased elms can be detected the more effective will be the control program. In early spring, shortly after bud break, trained scouts begin a thorough examination of each tree for DED symptoms. When detected, symptomatic trees are numbered and twig samples collected for culture diagnosis at the NCP, ESL. Although most cases of DED are detected in June and early July, surveillance is continued throughout the summer.

Examination of individual trees by trained scouts is generally successful in achieving thorough diagnosis. However, when large numbers of trees grow in an extensive area, such as the Federal Enclave, this procedure becomes time consuming thereby making early detection throughout the region difficult. In addition, scouting may miss crown symptoms not visible from the ground. These scouting problems have elicited a cooperative remote sensing program between NASA at Wallops Island, Virginia, and the ESL. Remote sensing coupled with imagery enhancement is currently being evaluated as a system for early detection of DED in NCP. It is hoped that a film/filter combination will be found that will allow efficient detection of diseased or stressed trees before they are noticeable with the naked eye. Early diagnosis presents a greater opportunity for successful treatment of diseased trees.



European elm bark beetle trap infested with beetles. The trap consists of hardware cloth coated and baited.

In spite of thorough spray and sanitation programs, control is never absolute. Each year several large, stately elms are lost. These trees, because of their size and location, are often prominent components of our Capital's landscape and their loss is severely felt. Recently, the Ecological Services Laboratory of NCP in cooperation with USDA Northeastern Forest Experiment Station, initiated an experimental program to save diseased elms by utilizing high pressure trunk and limb injections with the systemic fungicide MBC.HCl (methy 2-benzimidazole carbamate hydrochloride). As soon as detected

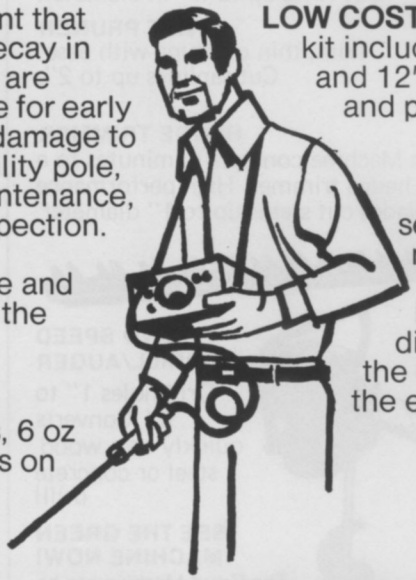
please turn page

NEW ELECTRONICALLY ACCURATE TREE AND POLE DISCOLORATION & DECAY DETECTION

A practical, low cost instrument that pinpoints discoloration and decay in their early stages before they are evident externally. Allows time for early treatment or removal before damage to surrounding area. Ideal for utility pole, park, and recreation area maintenance, and forestry research and inspection.

EASY TO USE Just drill a hole and probe...the Shigometer tells the story.

LIGHTWEIGHT, PORTABLE Shigometer weighs only 3 lbs, 6 oz ...drill and bit weight depends on model selected.



LOW COST, BATTERY OPERATED Complete kit including Shigometer, two 3/32" bits 8" and 12" long, four 8" and two 12" probes, and portable, cordless drill $455.00. Kit without drill $390.00.

The Shigometer is an extremely sensitive instrument that accurately measures any amount of ionization to provide detection of both incipient and advanced decay and discoloration. Shigometer indicates the degree of tissue deterioration and the extent of tissue damage. Complete instruction manual and 12 month warranty included with each Shigometer.

FORESTRY AND ENGINEERING SUPPLIES

THE
Ben Meadows Company

3589 BROAD STREET, ATLANTA (CHAMBLEE), GEORGIA 30341
404/455-0907, CABLE ADDRESS "BENCO"

4083

DUTCH ELM DISEASE

continued

diseased trees exhibiting less than 30 percent infection, are given a therapeutic trunk injection. (It is felt that trees exhibiting greater than 30 percent symptomology are well beyond the stage where systemic fungicide treatment would be effective and are therefore removed.) Injections are made at 70 psi with the tree injection apparatus developed by G. F. Gregory and T. W. Jones of the USDA Forest Service or with a conventional Spartan power sprayer, equipped with 13-gallon polyethylene carboys calibrated in liters per trunk diameter inch.

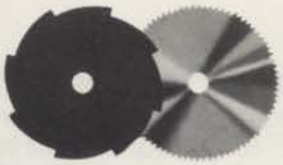
Injector heads are nailed to the trunk at six-inch intervals and connected to the pressure injectors with PVC nylon reinforced hose equipped with quick coupler connectors. With the aid of a skylift truck and a long delivery hose, diseased limbs are also injected near the main trunk. By injecting the diseased limb an effort is made to purge any infection at the limb's union with the main trunk. Diseased limbs are removed shortly after injection. For expediency, if DED is evident in several limbs, only the trunk is injected, and the diseased limbs removed promptly thereafter. Elms that are within 50 feet of diseased trees are given prophylactic trunk injections in an attempt to protect against root graft and beetle transmission of DED.

During the summer of 1975, 60 elms contracted DED in the Federal Enclave which encompasses such notable areas as the White House, the Ellipse, Lafayette Park, the Jefferson and Lincoln Memorials, the Mall, West Potomac park and sections of Constitution and Independence Avenues. In the past, since little hope could be offered for a tree with DED, most diseased trees were removed. However, in 1975 half of the diseased trees were considered worthy of treatment and allowed to remain standing. The effectiveness of this injection and pruning program can only be evaluated as time goes on. It is hoped, however, that many of the treated trees will overcome the disease and continue to contribute to the Park landscape for many years.

Another vital aspect of our integrated program has been a continuing search for DED tolerant elms. Several European and American clones which exhibit high tolerance to DED have been selected from the diverse NCP elm population. These selections are currently being evaluated by the ESL for future use in the Park. ESL researchers are constantly searching for other plant materials from European, Asian, and American sources that might also be of use. Monoculture of the American elm has lead to the demise of many urban plantings. Incorporation of a diversity of elms tolerant to DED may reduce the possibility of extensive elm losses. Diversity may also prevent extensive losses from other elm problems such as phloem necrosis which, fortunately, has yet to be found in the Washington, D.C. area. □

Now! A nylon cord weed trimmer that converts to six different tools!

Meet the amazing Green Machine. Nylon filaments spinning at over 5000 rpm zip through grass and weeds in seconds, even into nooks and crannies. Weight is only 14 lbs. The Green Machine's rugged 22.5 cc engine operates in any position and can be used with five optional attachments:



BRUSH CUTTER
Tackle the tough stuff with this brush-blade attachment. Cut vines up to ½" in diameter.

TREE PRUNER
Trim, thin or prune with ease! Cut saplings up to 2".

HEDGE TRIMMER
The Green Machine converts in minutes to a husky 30" hedge trimmer. High performance blades cut stems up to 1" diameter.

TWO SPEED DRILL/AUGER
Drill holes 1" to 6". Converts quickly to a wood, steel or concrete drill!

SEE THE GREEN MACHINE NOW!
The Green Machine can be bought in any combination of engine and accessories. See them at your dealer or write for our fact-filled brochure.

The Green Machine.™
HMC, Inc., 22133 S. Vermont, Torrance, CA 90502

Circle 105 on free information card

There was no sleeping on the job in the creation of a MAN MADE bluegrass!

SOMEBODY STAYED UP NIGHTS TO PRODUCE

Adelphi
KENTUCKY BLUEGRASS

RATED OUTSTANDING for overall performance in 10 years of testing at Rutgers University

Adelphi Kentucky Bluegrass is, truly, the product of many sleepless nights. The nature of bluegrass is such that hybridization can be achieved ONLY AT NIGHT and, there's no telling what time of night will be the right time.

So, aside from expertise and dedication, many patient night hours went into mating the parents of Adelphi. The result... ADELPHI KENTUCKY BLUEGRASS (U.S. Plant Patent No. 3150)... was well worth it.

ADELPHI, the first marketed, "Man-Made" Kentucky bluegrass has proven itself... with outstanding overall performance ratings in tests against as many as 60 new varieties... in New Jersey, Ohio, Michigan, Tennessee, Colorado, Rhode Island, Illinois and Washington.

ADELPHI is becoming a favorite of professional turfmen and home gardeners as well. For good looking and natural, richer, darker green color throughout the growing season... excellent density ...good disease resistance and tolerance to moderately close mowing, it's "Man-Made" ADELPHI... A FIRST IN TURF.

ADELPHI has been chosen by the Plant Variety Protection Office, U.S.D.A., as A STANDARD FOR DARK GREEN COLOR to which all bluegrasses applying for plant protection will be compared for color classification.

(Use of this statement does not indicate any approval or recommendation of Adelphi by the U.S.D.A.)

Try it. This grass shouldn't give YOU sleepless nights!

For Information, contact:

J & L ADIKES, Inc.
Jamaica, N.Y. 11423

NORTHRUP, KING & CO., Inc.
Minneapolis, Minn. 55413

JONATHAN GREEN & SONS
Farmingdale, N.J. 07727

VAUGHAN-JACKLIN CORP.
Bound Brook, N.J. 08805 • Downers Grove, Ill. 60515

Canadian Inquiries: **National-NK Seeds Ltd.**, Box 485, Kitchener, Ont. • **Rothwell Seeds Ltd.**, Box 511, Lindsay, Ont.
Other International Inquiries: **Northrup, King & Co., Inc.**, Minneapolis, Minn. 55413

Circle 137 on free information card

Fusarium Blight

from page 9

leaves, and a crown and root rot. Because of the predominant leaf-symptom pattern, we named the disease "*Fusarium* blight."

SYMPTOMS

Leaf Blighting Stage

In overall view, affected turfgrass stands first show scattered, light-green patches 2 to 6 inches in diameter. Under environmental conditions favorable for disease development, the color of these patches changes in 36 to 48 hours to a dull reddish brown, then to tan, and finally to a light straw color. Initially, the shapes of the patches are elongated streaks, crescents, or circular patches.

The most characteristic feature of the gross symptomatology is seen in the later stages of disease development, when more or less circular patches of blighted turfgrass 1 to 3 feet in diameter are present. Light tan to straw colored, these patches often have reddish-brown margins 1 to 2 inches wide and contain center tufts of green, apparently unaffected, grass. This combination produces a distinctive "frog-eye" effect. When optimum conditions for disease development exist for an extended period of time, these affected areas coalesce. As a result, large areas of turfgrass may be blighted. Leaf lesions originate both at the cut tip and at random over the entire leaf. At first, lesions appear as irregularly shaped, dark-green blotches. These rapidly fade to a light green, then assume a reddish-brown hue, and finally become a dull tan. Individual lesions may involve the enitire width of the leaf blade and may extend up to ½ inch long.

Root Rot State

Turfgrass plants affected primarily by the root rot phase of the disease are stunted, pale green in color, and

'Because of the predominant leaf-symptom pattern, we named the disease Fusarium blight' — Couch

do not readily recover from mowing or adverse weather conditions. Their roots are characterized by a brown to reddish-brown dry rot. As the disease progresses, these roots become darker in color due to the colonization of soil saprophytes. During periods of relatively high soil moisture, the pinkish growth of *Fusarium roseum* and *F. Tricinctum* can be seen on the root and crown tissue near the soil surface.

DISEASE CYCLE

Sources of Inoculum

Both species of *Fusaria* have been reported to be transmitted on turfgrass seed. Also, they are known to be capable of surviving in the soil as saprophytes. These two sources constitute the main reservoirs of primary inoculum for the development of the disease in newly seeded stands of turfgrass. In established turfgrass, the main sources of inoculum are dormant mycelium in plants infected the previous season and thatch that has been colonized by the pathogens.

How Fusarium Penetrates Leaves

Leaves are infected both by germinating spores and by mycelium from the saprophytic growth of the pathogens on the thatch and other organic matter. Most of the primary infections probably originate from the thatch. Spores germinate 12 hours from the onset of favorable environmental conditions. Penetration of intact leaf surfaces occurs at the junction of epidermal cells. At the points of direct leaf penetration, there is no evidence of degradation of the host cell walls. The most common area of penetration of foliage by the pathogens appears to be cut ends of the leaves. With both direct penetration and entry through cut leaf tips, the fungus grows between the cells over an area of 12 or more cells and then becomes intracellular. This explains the sudden appearance of large blotches on the leaves, instead of small spots that progressively become larger.

Optimum Conditions for Disease Development

Certain isolates of *F. roseum* and *F. Tricinctum* have been shown to vary in their temperature requirements for optimum pathogenicity. As a general rule, however, the foliar stage of *Fusarium* blight is most severe during prolonged periods of high atmospheric humidity with daytime air temperatures of 80° to 95° and night air temperatures of 70° F. or above. Turfgrass grown under deficient calcium nutrition is more susceptible to *Fusarium* blight than well-nourished turfgrass. Incidence and severity of the disease is also greatest under conditions of high nitrogen fertilization. The development of *Fusarium* blight has been reported to be greater in turfgrass when the soil moisture content has been allowed to be extracted to the permanent wilting percentage.

CONTROL OF FUSARIUM BLIGHT

Cultural Practices

While high nitrogen fertilization does increase the susceptibility of turfgrass to *Fusarium* blight, it is unlikely that a significant reduction of the disease can be effected by reducing nitrogen levels. In general, the level of nitrogen fertilization required to significantly reduce the severity of *Fusarium* blight is well outside the range necessary to meet the basic nutritional requirements of the grass. From a field standpoint, then, nitrogen fertilization, and its effects on the disease, should be considered with respect to thatch management.

Since the thatch serves as the major reservoir of inoculum in established stands of turfgrass, a successful program of *Fusarium* blight control requires that the quantity of this material be held to a minimum consistent with the proper management of the grass species in question. For most turfgrasses, this optimum thickness is approximately ½ inch. In order to keep the *Fusarium* blight potential of a stand of turfgrass to a minimum, therefore, increases in the rate of nitrogen fertilization should be balanced with concurrent increases in the intensification of the thatch management program.

Host Resistance

Ranked in order of susceptibility to *Fusarium* blight, the bentgrasses are the most prone to the disease. The Kentucky bluegrasses are next in susceptibility. The fescues are most resistant. Among certain varieties of Kentucky bluegrass, the range of susceptibility to *F. roseum* and *F. tricinctum* is determined by a complex interaction of air temperature and pathogen and host genotypes.

Chemical Control

A preventive fungicide program, coupled with that control, is essential for effective control of *Fusarium* blight. The fungicide application should be made immediately after the first occurrence of night temperatures that do not drop below 70°F. For most effective control of *Fusarium* blight, spray 1,000 square feet with 6 gallons of water containing 5 to 8 ounces of benomyl 50-percent wettable powder. The total amount of benomyl applied to the turfgrass within one calendar year should not exceed 8 ounces.

Factors Affecting Fusarium Blight Development

by Herbert Cole, Jr.

This symposium provides a unique opportunity to explore in depth a disease that remains an enigma to all who work with turf. From the view of the research scientist, it is a frustrating challenge to gain understanding. From the view of the golf superintendent with bluegrass fairways, it has become an impossible monster. The papers in this symposium will, we hope, present the best knowledge currently available about *Fusarium* blight. There will not be agreement among the participants; in fact, agreement will be out of the question. Each view will be based on the geographic region and experience of the researcher.

The following discussion of factors affecting *Fusarium* blight is based on my personal observations in Pennsylvania and the mideastern United States, complemented by a review of the available research literature. I believe that we do not fully understand *Fusarium* blight development even 10 years after the report of its first occurrence and development (Couch and Bedford, 1966). Our lack of understanding includes all aspects of the disease: symptoms, turf age, water, grass nutrition, thatch, varietal susceptibility, and control practices. Some researchers believe the disease differs in symptoms as well as infection cycle in the various geographic areas of its occurrence. Most, if not all, of the experimental research on the infection cycle of the disease has been done with seedling grass plants in growth chambers of greenhouses. The problem in the field is associated with aging of turf stands (three years and older), yet most of the researcher has been done with seedlings. Our knowledge with other plants diseases has always indicated that it is questionable to use seedlings to study a disease of mature or aged plants. Because of this, we desperately need new disease-cycle research on mature turf.

We are not certain if the predominate problem is a foliar blight phase or a root and crown rot infection phase. On seedling and mature turfgrass in a dew chamber, foliar lesions develop. However, on the golf course or home lawn during dry weather and moisture stress, turf may wilt and die in a period of days with no clear foliar lesion picture — merely badly rotted crowns and portions of roots. Californians feel strongly that in the West only crown and root rot are involved; in the East the battle rages between the foliar blighters and the nematode-root rot complexers. At this time we just don't have an understanding of the Midwest-Eastern problems. I believe the failure of classic protectant fungicides to provide control suggests a major role for the crown and root rot hypothesis in the East also. No one has reproduced the frog eye, ring, or serpentine symptom through artificial inoculation, in either the greenhouse or the field. Classic foliar infection epidemiology cannot explain a ring or a frog-eye tuft in the center of a dead area. No other foliar-infection fungus disease produces similar symptoms on plants, including the grasses. The ring or frog eye seldom or never occurs in the Far West. To my knowledge, no turf pathologist has attempted to explain why rings or frog eyes may occur.

Most researchers would agree that the major factors influencing disease development include the physical and biological environments, especially cultural practices that affect these environments. The major factors that most of us would agree upon in terms of importance in disease development are grass variety, turf age, temperature, moisture and irrigation, thatch, and nitrogen fertilization. The role of plant parasitic nematodes in predisposing turf to *Fusarium* blight remains highly controversial at this date. A serious study of the disease should include review of all the papers listed in the references, among others. In particular, the research and review papers of Cook (1968, 1970), who has worked extensively with a *Fusarium* root and crown rot of moisture-stressed winter wheat, may be among the most pertinent in understanding *Fusarium* blight of turfgrass.

Fusarium blight is primarily a disease of bluegrass fairways of golf courses and intensively managed bluegrass home lawns. Although some research would suggest that greenhouse growth chamber studies show bentgrass is most susceptible, the field experience indicates that in practice bentgrass green, tees, or fairways are seldom affected. It would seem this lack of disease is due to the vigorous nature of bentgrass summer growth and stolon production coupled with regular irrigation intervals. In the East we are seeing some problems on fescue and ryegrasses but certainly not any remotely approaching bluegrass disease incidence. Merion is the variety with by far the most problems. The new varieties vary in susceptibility but their ultimate field response is not clear. *Fusarium* is a highly variable fungus genus. Research so far suggests that there will be races and strains of the *Fusarium* organism interacting with different species and strains of grass. A variety may be resistant one place and susceptible in another. In all probability the dense, vigorous, decumbent bluegrass will have problems with the disease if grown widely.

please turn page

Fusarium Blight

continued

Temperature plays a major role in disease development. The most severe problems occur on the southern range of bluegrass adaptation, where high midsummer temperatures occur. A hot summer is always worse than a cool summer. In terms of micro-climate a southern slope or exposure or warm bank is usually worse than a cool northern slope. Sites with poor air drainage that heat up are usually worse than well-cooled areas. Problems can appear whenever air temperatures reach the high 70's for prolonged periods during the day, such as mid-June through September in much of the Midwest and East. Data are lacking, however, on the critical precise temperature aspects of the problem under field conditions.

'From the view of the golf superintendent with bluegrass fairways, it has become an impossible monster'—Cole

Moisture stress must be present for symptom appearance. It is not known whether soil moisture stress or internal plant moisture stress is the most critical factor for disease development and symptom appearance. However, in the field situation both moisture stresses will occur simultaneously. The work of Cook (1968) on *Fusarium* root rot of wheat may explain this aspect of the problem. For example, external moisture stress in the soil and thatch may enhance growth of the *Fusarium* fungus in these areas and suppress bacterial antagonists of the *Fusarium*. Internal moisture stress in the grass plant may enhance explosive colonization of the crown and roots as well as other areas by the *Fusarium* fungus. Much can be learned about the turf *Fusarium* blight problem, I believe, by analysis of the dry land wheat *Fusarium* root rot literature. At first glance, regular summer irrigation would be the simple answer to this problem. However, most turf managers intentionally drought-stress Kentucky bluegrass turf during the summer to minimize competition from annual bluegrass and creeping bentgrass. Hence, a management practice to suppress one problem may accentuate another.

Thatch accumulation appears necessary for severe disease development, but there is not complete agreement on this issue. Usual thatch measurement procedures and dethatching experiments have not shed much light on the matter. Unfortunately, many unaccounted variables enter into any discussion of thatch. In certain soils grass may be growing roots and all in an accumulation of thatch with little soil penetration; in others, roots may be several inches deep in soil regardless of thatch accumulation. Most experimentation has involved a single season with no control over or observation of other variables beyond thatch *per se*. When extensive multi-year comprehensive experimentation is done, I believe thatch will be demonstrated to play a significant role in disease development, especially from the view of *Fusarium* survival and a food base for crown invasion. The need for thatch may partially explain the failure of artificial inoculation procedures employing spore (conidial) sprays on young, thatch-free turf plots. *Fusarium* blight usually does not appear until a turfgrass planting reaches three or more years of age. The preceding thatch discussion may explain this delayed appearance. Another factor may be physiologic maturity changes in the turfgrass plant. It is well documented for many plant species that physiologic chemistry and even anatomical details change with increasing age. In addition, alterations in characteristics of tillers may take place through nutrient depletion or accumulation, crowding, or soil physical changes. Hence, an individual tiller in a turfgrass planting at an age of three years may differ in susceptibility and response from the original seedling plants.

Many field observations and greenhouse experiments suggest that high levels of available soil nitrogen increase disease severity. However, there is not complete agreement on this point, and some greenhouse studies have not demonstrated any nitrogen fertilizer effects. Cook's research (1968) with wheat root rot may shed light on this apparent paradox. In that instance, the nitrogen fertilizer effect induced development of a vigorous plant, which resulted in accentuated water extraction and greatly increased water strees both within the plant and within the soil. The resulting water stress allowed explosive invasion and colonization of the crown and root area of the plant as well as reduction of soil bacterial antagonism against the *Fusarium* fungus. A possible explanation of the confused results regarding nitrogen fertility in bluegrass may be the recycling of nitrogen through organic matter decay. A single year's shift in fertilization practices will not offset several preceding years of high nitrogen treatments. Fertilization management must be considered in terms of multiple years, preferably beginning with a new planting. Attempts to manipulate nitrogen in a 5-year-old turf stand may be hopeless from a commercial or research viewpoint, if considerable organic nitrogen in present.

The nematode question with regard to *Fusarium* blight remains a sticky, unresolved issue at the nationwide level. In Pennsylvania we have not been able to demonstrate an associative or causative relationship between any plant parasitic nematode and the presence of or control of *Fusarium* blight. One of our worst *Fusarium*-blighted golf courses had almost no plant parasitic nematodes, and extensive nematicide treatment did not suppress the disease in any way. However, I believe that such a relationship is possible and may be present in the East, but we have not yet worked with the site where it may be present. The nematodes' role, as I view it, could be twofold: They could provide infection sites, as demonstrated with other *Fusarium* diseases, and they could restrict root development and water uptake, thus predisposing the plants to infection through moisture stress. I do not feel that a nematode presence is essential for disease development. Fungicide tolerance has recently appeared among the *Fusarium* species. This has been reported for turf from New York (Smiley, personal communication) and observed recently in Pennsylvania. In one instance benomyl was successfully used in a course-wide program during 1974 for *Fusarium* blight suppression; the next year massive course-wide tolerance to benomyl appeared — 16 to 19 ounces of

product per 1,000 square feet applied in two applications on a preventive basis gave no control. Because of the problem of cross-tolerance among 11 benzimidazoles, all currently registered fungicides are eliminated for 1976 for effective use on *this* golf course for the disease.

In summary, *Fusarium* blight is a many-sided problem affected by various aspects of the environment. Most turfgrass scientists will agree that warm air and soil temperatures, soil moisture stress, high nitrogen fertility, thatch accumulation, turfgrass age, and turfgrass variety play a major role in disease development. However, for most of these factors the specific details of their influence have not been worked out, and we can speak at present in generalities only. For certain critical aspects of the disease cycle, such as symptom appearance and crown-root rot infection vs. foliar infection, I do not believe that we have a sound basis for understanding the natural situation in the field. We need much more information in all areas if we are to cope with this problem in a rational manner. Hence, we in turfgrass research must direct our efforts to further understanding of *Fusarium* blight if we are to provide meaningful recommendations to the turf industry. My first priority would be to resolve the crown and root rot vs. foliar infection controversy. After this is resolved, I believe many other things will fall into place quite rapidly.

REFERENCES

Bean, G. A. 1966. Observations on *Fusarium* blight of turfgrass. *Plant Dis. Reptr.* 50:942-945.

Bean, G. A. 1969. The role of moisture and crop debris in the development of *Fusarium* blight of Kentucky bluegrass. *Phytopathology* 59:479-481.

Cole, H., S. W. Braverman, and J. Duich. 1968. *Fusarium* and other fungi from seeds and seedlings of Merion and other turf-type bluegrass. *Phytopathology* 58: 1415-1419.

Cole, H., Jr., L. B. Forer, P. E. Nelson, J. R. Bloom, and M. H. Jodon, 1973. Stylet nematode genera and *Fusarium* species isolated from Pennsylvania turfgrass sod-production fields. *Plant Dis. Reptr.* 57:891-895.

Cook, R. J. 1968. *Fusarium* root and foot rot of cereals in the Pacific northwest. *Phytopathology* 58:127-131.

Cook, R. J., and R. I. Papendick. 1970. Effect of soil water on microbial growth, antagonism, and nutrient availability in relation to soil-borne fungal diseases of plants. Pp. 81-88 in *Root diseases and soil-borne pathogens,* Toussoun, Bega, and Nelson (Eds.). Univ. of Calif. Press.

Couch, H. B., and E. R. Bedford. 1966. *Fusarium* blight of turfgrasses. *Phytopathology* 56:781-786.

Cutwright, N. J., and M. B. Harrison. 1970. Chemical control of *Fusarium* blight of Merion Kentucky bluegrass turf. *Plant Dis. Reptr.* 54:771-773.

Cutwright, N. J., and M. B. Harrison. 1970. Some environmental factors affecting *Fusarium* blight of Merion Kentucky bluegrass. *Plant dis. Reptr.* 54:1018-1020.

Endo, R. M. 1961. Turfgrass disease in southern California. *Plant Dis. Reptr.* 45:869-873.

Fulton, D. E., H. Cole, Jr., and P. E. Nelson. 1974. *Fusarium* blight symptoms on seedling and mature Merion Kentucky bluegrass plants inoculated with *Fusarium roseum* and *Fusarium tricinctum. Phytopathology* 64:354-357.

Factors Affecting Fusarium Blight in Kentucky Bluegrass

by R. E. Partyka

Fusarium blight on Kentucky bluegrass varieties is a major disease in the Midwestern and Eastern States. In general, it is assumed that the organisms are present in most turf areas, and infection is related to stress conditions. Some consideration should be given to what causes the turf to go into stress.

Two components of stress are soil drought and temperature. These problems prevail where there are heat sink areas, such as curb stones, sidewalks, or driveways. Poor soils (gravel) in these areas dry out sooner, allowing the turf to go into stress. Sloping terrain with a southern exposure is often stressed before other areas. Another consideration is the physiological drought of the plant and its relation to temperature. Plants with restricted roots will stress easily. Reasons for a limited root system are varied but most include clay soils where oxygen and carbon dioxide levels are not conducive to good root growth. Soil pH may be a limiting factor as may be nutrient levels, especially phosphorus. Compaction may be important in some areas, especially if heavy riding equipment is used on wet soils at the wrong times.

Thatch contributes to the potential of inoculum carryover, but it may also interfere with active root development. Careful examination of turf growing in a thick thatch layer will reveal active roots in the thatch layer with little contact with the soil and, thus, out of contact with the capillary moisture level. Thatch may actually develop to become a definite moisture barrier. Some concern may exist as to the gasses produced in the thatch level from microbial activity and their effect on root growth and nutrient absorption; this could be a factor if high levels of carbon dioxide are involved. Stress may be related to improper practices of handling sod after it is harvested. Dry sod or sod allowed to heat in transit may be damaged so that *Fusarium* can become established without being evident until some later date. Sod laid down on dry soil or not watered for a long time can be stressed. Another phase of stress may be associated with a sod-soil (clay) interface problem. Poor permeation of water or capillary action at the interface will result in a poor root system, which can result in a stress situation. If temperature conditions are favorable and the organism is present, *Fusarium* blight will become evident.

Other root-damaging causes are often related to insect feeding, nematodes, and, if present, possibly garden symphylans. Any one or a combination of these causes may result in stressed turf. Predisposing root organisms may be involved under certain conditions. One may question whether organisms such as *Pythium* or *Rhizoctonia* may be present at low levels of activity early in the growing season and are capable of weakening the turf so that *Fusarium* becomes established readily under favorable conditions. Nutritional imbalance that favors rapid top growth and poor root development may result in stressed plants. Calcium levels in plant tissue as related to soil and thatch levels have been discussed in the literature. The question of calcium nutrition in plants with the entire root system in the thatch layer may relate to pH levels and stress.

Cultural factors that relate to the area may have to be considered in some cases. Construction site and soil type are important with modern building practices. Bulldozer work and fill soils do not provide optimum soils for turf. The degree of the grade coupled with thatch

please turn page

Fusarium Blight

continued

may result in poor water penetration and predispose the turf to stress conditions. Irrigation practices based on weather requirements or a time clock may be a factor in creating less than optimum growing conditions. Nutrient levels used to maintain turf at a specific aesthetic quality may be providing nutrients favorable for pathogen buildup. In some cases, one may question major shifts in climate or community design that favor the buildup of disease-causing organisms.

Improved turfgrass varieties may be a better host for the pathogen or provide better microclimate conditions for the fungus to grow. A greater need for instant grass has resulted in more sod being grown on soils that may be contaminated with *Fusarium,* or there may be selectivity for *Fusarium* associated with the use of fungicides or related pesticides. The changing air pollution load in some areas may be associated with stress. Sod handling practices by subcontractors leave much to be desired at times when sod stress is the issue. The degree of *Fusarium* blight indicates that the complexity of the problem is more than realized initially. To determine whether this is strictly associated with the pathogen or whether changing cultural practices also influence the level of stress will require further research to identify the situation as it currently exists.

Effects of Cultural Practices On Fusarium Blight Incidence In Kentucky Bluegrass

by A. J. Turgeon

Diseases of turf result from the combination of a susceptible host and environmental conditions conducive to the pathogenic activity of specific disease-causing organisms. For example, leaf spot *(Helminthosporium vagans)* disease typically occurs in susceptible varieties of Kentucky bluegrass under the cool, moist conditions occurring in midspring, while brown patch *(Rhizoctonia solani)* develops on closely clipped turfs during the hot, humid weather of midsummer. However, the extent of turfgrass deterioration from pathogenic organisms is frequently associated with additional factors as well. The cultural program of fertilizing, mowing, and irrigating may substantially affect the severity of disease incidence in a turf during certain periods in the growing season.

Field research and practical experience in managing turfs have resulted in the evolution of certain principles of turfgrass culture that are based, in part, on the association of mowing height and frequency, fertilization rate and timing, and other such factors with the incidence and severity of diseases. Most of these observations have been on Kenblue-type (common) or Merion Kentucky bluegrasses and traditionally have used cultivars of other turfgrass species. Today, increasing numbers of superior cultivars are being planted for many different uses and cultural intensities. Questions arise regarding the application of established principles of culture to the newer varieties. Apparent differences in turfgrass density, vigor, disease susceptibility, and other parameters suggest that the principles of culture may change somewhat from cultivar to cultivar.

A study was initiated at the University of Illinois in which five Kentucky bluegrass cultivars (Nugget, Merion, Fylking, Pennstar, and Kenblue) were maintained under two mowing heights 0.75 and 1.5 inches) and four fertilization regimes (2, 4, 6, and 8 pounds of nitrogen per 1,000 square feet annually) beginning April, 1973. By early August, with half of the fertilizer applications made, differential development of *Fusarium* blight disease was observed in plots (Turgeon and Meyers, 1974). Generally higher spring fertilization rates were associated with substantially higher incidence of the disease in summer. This was evident in all cultivars except Kenblue, which was severely affected regardless of fertility level. Pennstar was essentially unaffected at the lowest (2 pounds) level of nitrogen fertilization, while slight to moderate blighting occurred in plots receiving the 4-pound level of nitrogen. The 6- and 8-pound nitrogen levels were associated with a severe incidence of *Fusarium* blight. Fylking was slightly to moderately blighted at the 2- and 4-pound nitrogen lev-

Table 1. Effects of Mowing Height and Fertilization on the Incidence of Fusarium Blight Disease in Seven Kentucky Bluegrass Varieties in 1975[a]

Mowing height (in.)	Fert.[b] (lb. N/ 1,000 sq. ft./yr.)	Variety						
		Windsor	A-20	Nugget	Merion	Fylking	Pennstar	Kenblue
.75	2	1.0	1.0	1.0	1.3	1.3	1.3	5.7
1.50	2	1.0	1.0	1.0	1.3	1.0	1.3	6.0
.75	4	1.0	1.0	1.0	1.3	1.7	2.0	5.7
1.50	4	1.0	1.0	1.0	1.3	1.7	1.3	4.7
.75	6	1.0	1.0	1.0	2.0	4.0	4.7	6.0
1.50	6	1.0	1.0	1.0	2.0	2.7	4.3	5.7
.75	8	1.0	1.0	1.7	4.3	6.0	6.3	7.0
1.50	8	1.0	1.0	1.3	4.3	5.0	6.0	7.0

[a] *Visual ratings of disease were made using a scale of 1 through 9 with 1 representing no disease and 9 representing complete necrosis of the turf.*

[b] *Fertilization was performed using a 10-6-4 ($N:P_2O_5:K_2O$) analysis water-soluble fertilizer applied in equal amounts in April, May, August, and September for two years on Windsor and A-20 and for three years on Nugget, Merion, Fylking, Pennstar, and Kenblue.*

Table 2. Relative Susceptibility of Kentucky Bluegrass Varieties to Fusarium *Blight in Illinois*

Disease susceptibility levels						
High	**Moderate**		**Low**		**No symptoms**	
Delft	**Ba 61-91**	**Kenblue**	**A-34**	**Merion**	**A-20**	**Monopoly**
EVB-305	**Brunswick**	**IL-3817**	**Ba 62-55**	**Cheri**	**Adelphi**	**P-59**
K1-138	**EVB-307**	**Nugget**	**Baron**	**Parade**	**Campina**	**P-140**
	Fylking	**PSU-197**	**Bonnieblue**	**Plush**	**Edmundi**	**PSU-150**
	Geronimo	**Park**	**EVB-391**	**PSU-169**	**Glade**	**Sodco**
	K1-157	**Pennstar**	**Galaxy**	**PSU-190**	**K1-132**	**Touchdown**
	K1-187	**RAM No. 2**	**K1-131**	**RAM No. 1**	**K1-143**	**Victa**
			K1-133	**Sydsport**	**Majestic**	**Windsor**
			K1-155	**Vantage**		
			K1-158			

els and severely diseased at higher levels. Merion responded in much the same manner as Pennstar, and Nugget was largely unaffected except at the highest nitrogen level. The incidence of *Fusarium* blight in Nugget, Merion, and Fylking was slightly higher in plots maintained at the 1.5-inch mowing height. No such difference was apparent in the Pennstar and Kenblue plots.

Continuation and expansion of this study with the inclusion of Windsor and A-20 Kentucky bluegrasses provided similar results during the next two growing seasons. No *Fusarium* blight symptoms were observed in Windsor or A-20, while Nugget, Merion, Fylking, and Pennstar characteristically showed more disease with increasing spring fertilization rates (Table 1). As in 1973 the severity of *Fusarium* blight disease was uniformly high in the Kenblue plots. Random probing of the plots revealed very severe soil compaction in the section of the field where the Kenblue plots were located, suggesting that compacted soil conditions may so weaken the turf that its susceptibility to *Fusarium* blight disease is much greater. Data from the Kentucky bluegrass variety plots, established in April, 1972, do not show Kenblue to be inherently more susceptible to *Fusarium* blight than Fylking, Pennstar, or Nugget under a moderate intensity of culture (4 pounds of nitrogen per 1,000 square feet a year, 1.5 inches mowing height) and fairly uniform soil physical conditions (Table 2).

Based on these observations, the varieties Deltt, EVB-305, and K1-138 should not be planted on sites where *Fusarium* blight is a concern; other varieties, including A-20, Adelphi, Glade, Majestic, Sodco, Touchdown, and Victa, appear promising because of the apparent lack of *Fusarium* blight symptoms during the period of observation.

Another factor believed to be of importance in the development of *Fusarium* blight disease is thatch. Many turfgrass scientists feel that the susceptibility of a turf to *Fusarium* blight may be greatly increased where substantial levels of thatch have been allowed to develop. While this may be true, there was no clear correlation between the thatching tendency of Kentucky bluegrass varieties (Table 3) and their relative susceptibility to *Fusarium* blight. For example, Touchdown Kentucky bluegrass was the most thatch-prone variety — its thatch layer averaged over 1.9 centimeters thick — while Park was the least thatch-prone variety, with only 0.71 centimeters of thatch. Yet, Park was found to be moderately susceptible to *Fusarium* blight while Touchdown showed no symptoms of the disease. Since recent results from tests at Rutgers showed that *Fusarium* blight incidence in Kentucky bluegrass varieties was dramatically increased where thatch-inducing calcium arsenate was applied to the plots (Funk, 1975), it is likely that thatch development is associated with more severe incidence of this disease in susceptible varieties. However, this relationship apparently does not exist when comparing the differenctial thatching tendency and *Fusarium* blightsusceptibility of different Kentucky bluegrass varieties.

An additional factor frequently associated with the severity of turfgrass diseases is whether or not clippings are removed as part of the mowing operations. Results from a study initiated in early 1974 showed that, at high nitrogen fertilization rates, the severity of *Fusarium*

please turn page

Table 3. Relative Thatching Tendency of Kentucky Bluegrass Varieties During the Fourth Season After Planting

Thatch depth, cm[a]	Varieties
More than 1.50	**Brunswick, EVB-305, Glade, Cheri, Nugget, P-140, RAM No. 1, Touchdown**
1.50 - 1.25	**A-20, Ba62-55, Baron, EVB-391, Fylking, K1-131, K1-132, K1-143, K1-187,Majestic, P-59, Plush, PSU-190, RAM No. 2, Sodco, Victa**
1.25 - 1.00	**A-34, Adelphi, Ba 61-91, Bonnieblue, Campina, Delft, Edmundi, EVB-307, Galaxy, Geronimo, K1-133, K1-138, K1-155, K1-157, K1-158, IL-3817, Merion, Monopoly, Parade, Pennstar, PSU-150, PSU-169, Sydsport, Vantage, Windsor**
Less than 1.00	**Kenblue, Park, PSU-197**

[a]*Thatching depth was determined by measuring the thickness of the thatch at four places on two plugs 2 inches in diameter taken from each of the three replicate plots of each variety.*

Fusarium Blight

continued

blight was reduced by clipping removal (Table 4). The basis for this relationship is not clearly understood; however, it does appear that clipping removal with mowing should be considered on highly fertilized sites where *Fusarium* blight has been a recurring problem.

Table 4. Effects of Clipping Removal and Fertilization on Fusarium *Blight Incidence in Kenblue Kentucky Bluegrass Turf*

Fertilization[a] (lb. N/1,000 sq. ft./yr.)	*Fusarium* blight rating[b]	
	Clippings removed	Clippings returned
2	1.3	1.2
5	1.5	1.7
8	1.5	3.7

[a] *A 10-6-4 ($N:P_2O_5:K_2O$) analysis water-soluble fertilizer was applied in equal amounts in April, May, August, and September for two years.*
[b] *Visual ratings of disease were made using a scale of 1 through 9 with 1 representing no disease and 9 representing no disease and 9 representing complete necrosis of the turf.*

A final cultural factor of importance in controlling *Fusarium* blight is irrigation. This is most evident during midsummer stress or drouthy periods when light watering has been instrumental in reducing disease symptoms and promoting turfgrass survival. A turf with a deteriorated root system cannot survive prolonged stress periods unless supplemental irrigation is frequent enough to prevent dessication of the plants. Although this practice is inconsistent with traditional principles of turfgrass culture, it may be necessary for the survival of a severely diseases turf.

In conclusion, there are two fundamental approaches
to controlling *Fusarium* blight in Kentucky bluegrass. The "environmental-oriented" approach is to adjust the cultural program by avoiding excessive nitrogen fertilization during spring, providing adequate moisture for turfgrass survival during stress periods through irrigation, performing appropriate cultivation practices to control thatch and alleviate soil compaction and applying effective fungicides properly. The "plant-oriented" approach involves the introduction of superior Kentucky bluegrass varieties that, under local conditions, do not appear to be adversely affected by the *Fusarium organism.*

LITERATURE CITED

Funk, C. R. 1975. Personal communication.
Turgeon, A. J., and W. R. Meyer. 1974. Effects of mowing height and fertilization level on disease incidence in five Kentucky bluegrasses, *Plant Dis. Reporter* 58:514-516.

The Role of Nematodes in the Development of Fusarium Blight

by J. M. Vargas, Jr.

Extensive surveys were made to determine if factors other than *Fusarium roseum* and *Fusarium tricinctum* were involved in the development of *Fusarium* blight. The surveys revealed that high populations of nematodes, especially the nematodes *Tylen-chorhynchus dubius* and *Creconemoides* spp., occured in *Fusarium*-blighted turfs.

A greenhouse study was conducted to determine what role, if any, the stunt (*T. dubius*) nematode played in the development of *Fusarium* blight. In this study, only *T. dubius* was able to produce most severely stunted top growth and root system, the two characteristic symptoms normally associated with *Fusarium* blight-infected turfgrass plants. The *F. roseum*-treated plants had reduced root and top growth, but the reduction was not significant when compared to the untreated controls. It appeared that the nematode was the dominant pathogen in the *F. roseum/T. dubius* interaction, which is responsible for *Fusarium* blight in Michigan. It must be remembered that Michigan is really borderline for *Fusarium* blight development. Michigan does not have the long periods of hot, humid weather normally associated with *Fusarium* blight development in more southern areas. In fact, our *Fusarium* blight outbreaks usually occur during periods of drought stress, whether it is hot and dry or cool and dry. Our worst outbreaks have been in late September and early October when the daily temperature did not go above the high 70's. So while the nematodes may be important in Michigan and other northern edges of the *Fusarium* blight region, they may not be as important in the more southern regions.

Before we had determined that nematodes were involved in the disease interaction, we had obtained control of the disease with the systemic fungicide Tersan 1991, but only where we drenched the material into the root zone. We originally thought this was related to the upward translocation in the plant of the systemic fungicide. These results were puzzling in light of the involvement of the nematodes in the development of the disease. Upon further investigation, Tersan 1991 was shown to be a nematicide in addition to a systemic fungicide. We now believe if it is drenched into the root zone and grass plants roots will pick it up and prevent nematodes from feeding. Tersan 1991, of course, can also protect the plant from infection by the *F. roseum* fungus. If *Fusarium* blight is an interaction between a nematode and a fungus, with the nematode being the dominant pathogen, then one should be able to control the disease with nematicides Dasanit and Oxymal. However, it appears that they must be applied early in the season, before the *Fusarium* blight symptoms begin to appear.

Drought stress appears to be the main factor in symptom development after infection has taken place. This is logical, since you have a weakened grass plant with a poorly developed root system; as soon as drought stress is applied, it will begin to wilt and eventually die. Light, frequently watering of *Fusarium*-blighted turfs during periods of drought stress can prevent *Fusarium* blight symptom development. During hot, dry weather, syringing lightly about midday may also be necessary, and symptom development of the disease can be prevented by following such a watering program. Not enough information is known to make recommendations concerning varieties that are resistant to *Fusarium* blight. However, there is enough evidence to show that Merion, Fylking, and Pennstar are three very

susceptible Kentucky bluegrass varieties that should not be used in areas where *Fusarium* blight is a problem.

SUMMARY

The disease *Fusarium* blight appears to be an interaction between nematodes and a fungus in which the nematode is the dominant pathogen. The symptoms of the disease occur during periods of drought stress in warm or cold weather. The disease can be controlled culturally by light, frequent watering during periods of drought stress or chemically with one of the recommended systemic fungicides or nematicides. Check with the turfgrass experts in your area for specific recommendation. CAUTION: Nematicides are exretemly dangerous to human health, and proper clothing and equipment must be worn when applying them. Again, it is advisable to check with an expert in your area before applying nematicides.

Developing Genetic Resistance To Fusarium Blight

by C. Reed Funk

The development of improved levels of a stable, race-nonspecific resistance to *Fusarium* blight should receive high priority in all areas where this disease is a present or potential hazard. This resistance must be combined with other genetic factors involved in the creation of attractive, dependable turfgrass cultivars with good turf-forming properties, tolerance of environmental stress, and good resistance to other important pests. These improved turfgrasses need to be widely adapted and have reduced maintenance requirements.

TYPES OF DISEASE RESISTANCE

Disease resistance in plants has been characterized as either race-specific or race-nonspecific. Race-specific resistance has been widely used in the genetic control of plant disease. It generally is controlled by a single, usually dominant, gene and produces a high degree of resistance to one or more specific races of the disease pathogen. Unfortunately, a variety possessing such resistance may be highly susceptible to other races of the same pathogen. Breeding programs using this race-specific form of disease resistance are frequently faced with the task of continually finding and adding new resistance genes to combat new races of the pathogen. This race-specific resistance has been used extensively in annual crops where new resistant varieties can readily be substituted as resistance in old varieties breaks down. Obviously, it is of much less value in our long-lived perennial turfgrasses.

Race-nonspecific resistance is normally conditioned by the combined action of several genes. It imparts a degree of resistance to all races of the pathogen and is generally relatively stable over long periods of time. In most cases race-nonspecific resistance does not confer the high level of disease resistance normally observed in varieties posessing a race-specific type of resistance. Plant breeding procedures using race-nonspecific resistance are also more difficult. Nevertheless, the development of varieties having the highest possible and most stable forms of race-nonspecific forms of disease resistance should be the primary goal of breeders of perennial species.

PREDISPOSING FACTORS

Observational and experimental evidence suggest that the *Fusarium* blight disease is more serious on turfgrass weakened by one or more environmental stress factors. Factors predisposing the turf to *Fusarium* blight might include the following:

- High temperatures.
- High humidity.
- Recurring drought stress.
- Reduced air circulation.
- Excessive nitrogen.
- Dense, lush growth.
- Thatch.
- Close mowing.
- Nematodes.
- Other diseases.

Varieties better able to tolerate the weakening effects of any of the above factors, which may occur at a critical stage in disease development, are less likely to be seriously damaged by *Fusarium* blight. This might account for much of the variety x test interaction observed in ratings of variety resistance. A variety such as Vantage, which is less tolerant of close mowing than some compace turftypes, may show very little *Fusarium* blight at a 2-inch mowing height but can be weakened by closer mowing to the extent that it becomes moderately susceptible. A variety growing in its area of best adaptation and receiving the management most favorable to its best performance is likely to be damaged less by this disease. The above factors, considered in connection with a highly variable pathogen and our present less than adequate evaluation techniques and information exchange, complicate our understanding of the amount and stability of the genetic resistance available. Nevertheless, we do see substantial variation in the amount of *Fusarium* blight damage to different turfgrass selections. The genetic components of this variation can be used in breeding varieties of improved resistance.

KENTUCKY BLUEGRASS

Kentucky bluegrass, *Poa pratensis* L., is the most important lawn-type turfgrass in the northern half of the United States. It is hardy, attractive, and widely adapted. A number of attractive turf-type bluegrasses with good resistance to the *Helminthosporium* leaf spot and crown rot disease have been developed in recent years. Most of these improved varieties are giving good performance in areas where summer stress conditions are not too severe. Nevertheless, the development of bluegrasses with greater tolerance of the long, hot summers of the transition zone remains a real challenge to the turfgrass breeder. An extensive program to collect and evaluate adapted germplasm from summer stress areas should provide germplasm to produce varieties

please turn page

Fusarium Blight

continued

with greatly improved summer performance and dependability.

Detailed examination of old turfgrass stands and variety trials located in summer stress areas of the Middle Atlantic region is providing us with valuable insights into different types of Kentucky bluegrass. Under conditions of moderately low nitrogen fertility and high, infrequent mowing, the tall, erect-growing, narrow-leafed common types such as Kenblue dominate. However, old turf areas that have been mowed regularly have very few bluegrasses of the erect, narrow-leaf common type. The narrow-leafed common types have apparently been weakened by leaf spot and replaced by large patches of a broader leafed, more prostrate, moderately open type with extensive deep rhizomes. These might be referred to as a Middle Atlantic common. Vantage, PS2, and P-154 are selections of this type. This Middle Atlantic common type of bluegrass with its deep rhizomes, somewhat greater intrinsic tolerance of heat, greater summer food reserves, deeper roots, and somewhat open growth is well suited to survive summer stress, especially if not overfertilized or mowed too closely.

Many of the very attractive, dense, lower-growing turf-type bluegrasses selected from cooler summer climates of Northern Europe and from other breeding and evaluation trials in less severe environments are often disappointing in southern trials. Their dense, attractive turf is the result of a very high population of tillers per unit area. This results in increased competition between each tiller for light, water, carbon dioxide, and nutrients. Each tiller has a smaller percentage of the root system for support and is more subject to drought stress. A higher humidity develops in this dense turf. Excessive thatch accumulation is more likely to occur. This favors many disease organisms, including *Fusarium*. Kentucky bluegrass is best able to tolerate the frequent close mowing, high fertility, and other factors associated with the production of dense, compact turf desired on golf course fairways and similar turf areas in regions of high light intensity, cool temperature, and low to moderate humidity. As we go into less favorable climates, we must compensate with improved varieties and better management.

There may be a fourth type of bluegrass, which we might refer to as a southern turftype, that is widely adapted, pest resistant, and tolerant of heat and drought. This type has the ability to produce an attractive, compact, dense, disease-free turf in favorable environments. It also has the phenotypic plasticity to produce the deeper roots and rhizomes and the more open growth habit of the middle Atlantic common type in areas of severe and prolonged summer stress. It has good heat tolerance and the ability to maintain higher levels of carbohydrate reserves through prolonged periods of hot weather. A few of our very best bluegrasses are approaching this description. Further improvements in heat tolerance and pest resistance, including better resistance to *Fusarium* blight, will be most helpful in meeting the challenge of the transition zone. For commercial success these varieties also have to be economical seed producers. Expanded efforts should be made to develop and identify these grasses.

New Brunswick Trials

Turf trials at New Brunswick, New Jersey, show that bluegrass varieties exhibit a wide variation in resistance to *Fusarium* blight under the conditions of our evaluation program (Table 1). We have had very little damage from *Fusarium* blight on most test fields. High levels of earthworm activity and perhaps other factors have virtually eliminated any thatch buildup except on fields treated with tricalcium arsenate or chlordane.

Three bluegrass tests on fields treated with tricalcium arsenate all show considerable thatch buildup

Table 1. Fusarium Blight Incidence on Kentucky Bluegrass Varieties, Blends, and Mixtures Grown at New Brunswick, New Jersey, 1975[a]

Variety	Percent diseased	Variety	Percent diseased
Enmundi	1	Merion	15
Windsor	1	Park	16
Adelphi	1	Victa	18
P-59	1	Baron	18
Parade	1	Cheri	21
Sydsport	3	Merion-Pennstar	23
Bonnieblue	4	Merion-Kenblue	24
Adelphi-Kenblue	4	Fylking-C26	27
Adelphi-Nugget	5	Nugget	29
Sodco	5	Nugget-Pennstar	29
Glade-Nugget	6	Fylking	31
Vantage	7	Pennstar	31
Glade	7	Delft	37
Adelphi-Fylking	8	Fylking-Pennlawn	37
Touchdown	8	Nugget-Park	38
Majestic	8	Fylking-Jamestown	45
Glade-Adelphi	10	Modena	52
Vantage-Victa	10	Enita	59

[a]*Test planted April, 1972. Half of each plot received tricalcium arsenate treatment, which produced a four-fold increase in Fusarium blight. Plots were mowed at ¼-inch height with moderately high fertility.*

and substantial damage from *Fusarium* blight. One half of each plot on the 1972 regional bluegrass test was treated with 4.8 pounds of tricalcium arsenate in both the spring and the fall of 1973. Thatch buildup has occurred on the treated half but not on the untreated half. The treated half shows four times as much damage from *Fusarium* blight as the untreated half. At our Adelphia location we have seen considerable *Fusarium* blight disease in fields not treated with tricalcium arsenate. Areas of these fields having reduced air circulation show substantially more from *Fusarium* blight.

THE FINE FESCUES

Fine fescues are generally tolerant of acid soils, low fertility, and shade. They perform best in cool climates and during cool seasons. They are intolerant of higher levels of nitrogen fertilizer and poor drainage during hot weather. The fine fescues currently showing the greatest potential for turf use can be classified into five types. Dr. Robert W. Duell, who is working closely with the fine fescues at Rutgers, refers to them as the Chewings, Creeping, Spreading, Hard, and Sheeps fescues. The Chewings, Creeping, and Spreading fescues are currently included in one species, *Festuca rubra* L. However, these three types are very different in appearance, growth habit, management requirements, adaptation, breeding behavior, and cytological characteristics. They should be classified as separate species.

The **Chewings type,** *F. rubra* L. subsp. *commutata* Gaud., is a fine-leafed, lower growing grass without rhizomes. Under mowing, these plants spread slowly by basal tillering. Where summers are cool, they will tolerate rather close mowing and will produce attractive dense turf requiring less fertilizer and less mowing than needed for a good bluegrass turf. A number of very attractive varieties of Chewings fescue have been developed in recent years by breeders in the United States and Europe. 'Jamestown,' 'Banner,' 'Koket,' and 'Highlight' are representative of the improved varieties within this group. Their dense growth habit can make them much more competitive and persistent in mixtures with Kentucky bluegrass than fescue varieties formerly available. This can be either an advantage or a disadvantage.

The **Creeping type,** *F. rubra L.* subsp. *Trichophylla* Gaud., is represented by European varieties such as 'Cumberland Marsh,' 'Dawson,' 'Golfrood,' and 'Oasis.' They are fine-leafed, low-growing varieties with short, thin rhizomes. Under mowing, they develop a turf similar in appearance to the improved Chewings type fescues. Some varieties within this group have demonstrated good salt tolerance. Currently available Creeping types are highly susceptible to dollar spot and are generally low seed producers. These factors limit the potential use of the Creeping types. It is hoped that improvements can be made in these characteristics, for some of our most leafspot-resistant germplasm is found within this group.

The **Spreading type,** *F. rubra* L. subsp. *rubra* Hack, is represented by varieties such as 'Fortress' and 'Ruby.' Spreading fescues have 56 chromosomes while Chewings and Creeping fescues have 42 chromosomes. Spreading fescues have somewhat wider leaves, longer and thicker rhizomes, and better seedling vigor than other fine fescues. They are less tolerant of close mowing, have a lower turf density, and produce less thatch than the Creeping and Chewings types. In trials in New Jersey and Maryland the Spreading types have shown considerably less damage from *Fusarium* blight than the Chewings types. Improved selections of Spreading fescues would appear to be more compatible with Kentucky bluegrass and would have greater seedling vigor, better performance under low maintenance, and possible better shade tolerance. Increased breeding efforts should be made to improve the Spreading fescues, especially in areas of severe summer stress.

The **Hard fescues,** *F. longifolia* Thuil., are receiving considerable attention since the development and release of 'Biljart' hard fescue (Scotts C-26) in Holland. The improved Hard fescues produce a turf comparable in texture and growth habit with the better varieties of the Chewings type fescue but with a somewhat slower rate of vertical growth, better resistance to some hot-weather diseases, and better adaptation to some poor soil conditions. Spring dormancy, slow recovery from injury, and costly seed production are problems that need improvement.

'The development of improved levels of a stable, race-nonspecific resistance to Fusarium blight should receive high priority' — Funk

The **Sheeps fescues,** *F. ovina* L., collected from old turf areas of the Northeast look interesting in our turf evaluation plots. Most selections appear "grainy" under mowing but have shown excellent persistance under severe summer stress conditions. They have good shade tolerance and good adaptation to poor soils.

TALL FESCUE

Tall fescue, *Festuca arundinacea* Schreb., is used extensively for pasture, hay, general-purpose turf, and erosion control throughout the summer heat stress zone of the United States. It has the ability to tolerate summer heat and drought stress in areas where other cool season grasses perform poorly. There would appear to be considerable potential for the plant breeder to make substantial improvements in the appearance and turf performance of this interesting grass even though breeding efforts to date have met with only limited success. Dense, attractive, fine-textured lower growing types currently available in our breeding collection need further improvements in pest resistance and tolerance of temperature extremes. Recent work in central Alabama show that nematodes can seriously limit rooting depth, drought tolerance, persistence, and productivity of tall fescue and other cool-season grasses. Well-organized and adequately supported team efforts by pathologists, nematologists, physiologists, and plant breeders might well produce tall fescue varieties of considerable value for areas where *Fusarium* blight is prevalent.

please turn page

Fusarium Blight

continued

PERENNIAL RYEGRASS

The development of improved turf-type perennial ryegrass (*Lolium perenne* L.) varieties such as 'Manhattan,' 'Pennfine,' 'Citation,' 'NK200,' 'Eton,' 'Derby,' 'Yorktown,' 'Diplomat,' and 'Omega' has made this species of considerable usefulness to the turf industry. These improved ryegrasses are substantially superior to common perennial ryegrass for many turf purposes. Like all ryegrasses, the new turf-types are quick and easy to establish and are adapted to a wide range of soil types and uses. When properly managed in their area of adaptation, these ryegrasses can be durable, persistent, and attractive. Instances have been reported where turf-type ryegrasses have given good performance on turf areas where Kentucky bluegrass has been seriously damaged by *Fusarium* blight. The turf-type ryegrasses appear to produce much less thatch than bentgrass, Kentucky bluegrass, and the Chewings-type fescues. A number of golf course superintendents in summer heat stress areas such as Washington, D.C., are having very promising success with overseeding established bermudagrass with blends of improved turf-type ryegrasses such as Manhattan, Pennfine, and Citation. Continued breeding efforts should lead to further improvements in mowing quality, summer performance, winter hardiness, and resistance to crown rust *(Puccinia coronata),* brown patch *(Rhizoctonia solani),* and leaf spot *(Helminthosporium siccans).* Improved resistance to *Pythium* is also needed for good summer performance of ryegrass in the humid summer heat stress region.

Techniques for Determination of Fusarium Blight Susceptibility In Kentucky Bluegrass

by William A. Meyer and Frank H. Berns

Fusarium blight is now recognized as a major disease problem of Kentucky bluegrasses and some other cool-season turfgrasses in the northeastern and midwestern sections of the United States (1,6) and in California (2) *Fusarium roseum* and *F. tricinctum* are the two species of fungi found by Couch and Bedford (1) to be the incitants of this disease.

Disease symptoms seldom appear until a turf stand is two or more years old. Occasionally, symptoms may appear during the first year of turf establishment. The severity of this disease may vary greatly from year to year, depending upon such environmental factors as heat and moisture stress. It is usually very difficult to get a uniform distribution of *Fusarium* blight throughout a replicated turf plot area. In the development of new Kentucky bluegrass varieties, it is important to establish their degree of susceptibility to *Fusarium* blight as well as other major diseases before they are released. Because of the time required for this disease to develop consistently in turf plots, rapid screening techniques are needed. The following paper will describe techniques which were developed to aid in the screening of Kentucky bluegrass cultivars for *Fusarium* blight susceptibility.

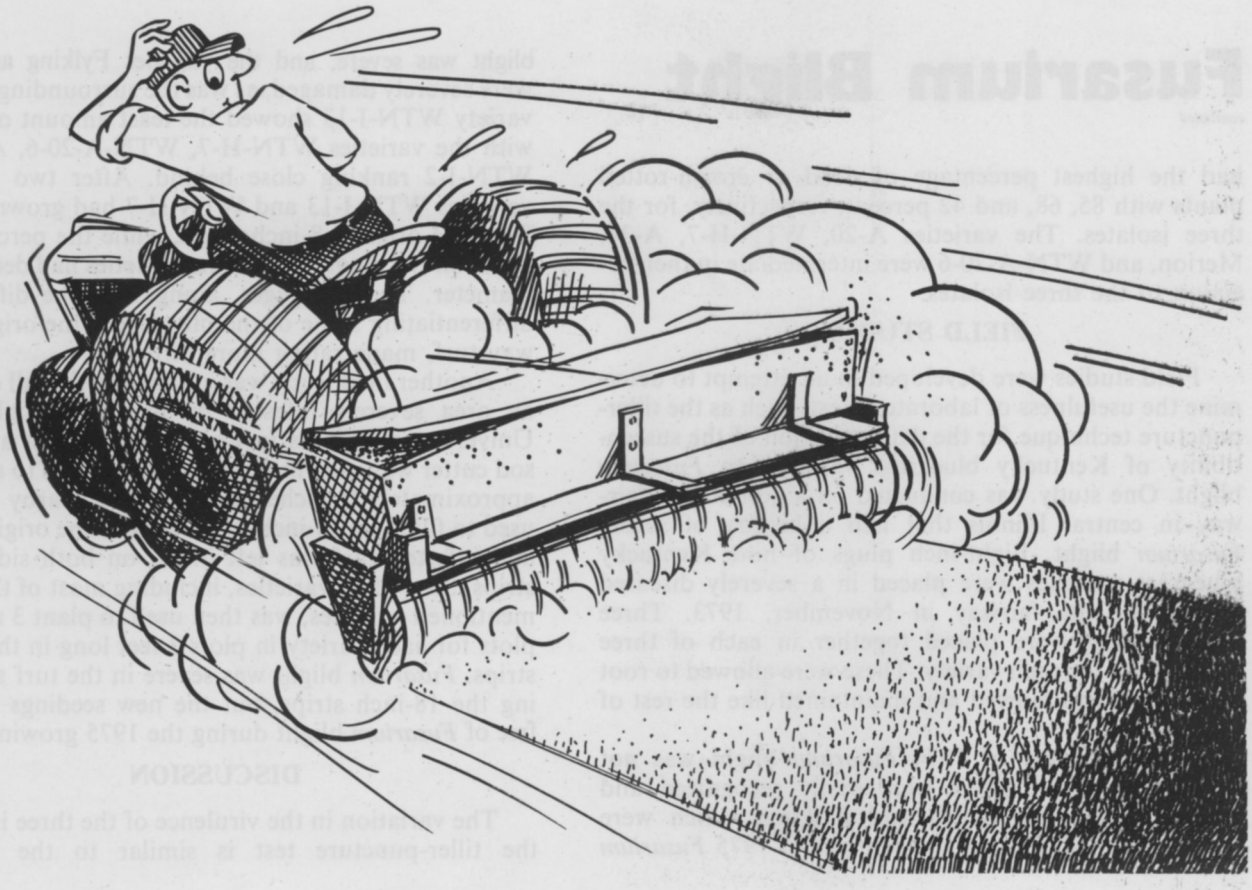
TILLER-PUNCTURE TECHNIQUE

With the tiller-puncture technique (4), 14 Kentucky bluegrass varieties were propagated from individual tillers and grown in 2-inch pots in the greenhouse for 50 to 75 days. They were then transferred to a growth chamber (14-hour day at 29° C, 24° C night; 4,000 foot candles; and 70 percent relative humidity) for three days prior to inoculation. A small sound (2 mm long) penetrating to the youngest enclosed leaf was made in each of two healthy tillers per pot between the crown area and third leaf. Mycelium pieces of *Fusarium trincinctum* isolate MSU1 or of *F. roseum* isolates U12 or KC1 were then placed in the wounds. Wet sterile peat moss was used to cover the wounded area of each inoculated tiller. Other tillers were wounded but noninoculated to serve as controls. In all, 60 tillers of each variety were inoculated with the MSU1 isolate, 36 tillers with the UI2 isolate, and 12 tillers with the KC1 isolate. All pots were then returned to the growth chamber and the peat moss was kept moist.

Foliar lesions could be seen on the emerging leaf two to three days after inoculation. In many tillers the initial fungal infections in the new and old leaves would advance down into the crown area of the plant and eventually cause death. Some tillers were killed within seven days on the most susceptible varieties. After two weeks all pots were removed from the chamber and rated for severity of infection. The MSU1 isolate was the most virulent isolate followed by UI2 and KC1. Leaf and crown lesions caused by the three isolates were similar on all of the varietiies. The experimental variety WTN-I-13 had the smallest percentage of crown-rotted and dead plants. Eighteen percent of the WTN-I-13 tillers were crown rotted or dead with the MSU1 isolate, 8 percent with UI2, and none with KC1. WTN-I-2 and Belturf were ranked next with slightly higher percentages of dead or diseased plants. The varieties P104, WTN-J79, and Fylking were the most severely affected.

Foliar lesions could be seen on the emerging leaf two to three days after inoculation. In many tillers the initial fungal infections in the new and old leaves would advance down into the crown area of the plant and eventually cause death. Some tillers were killed within seven days on the most susceptible varieties. After two weeks all pots were removed from the chamber and rated for severity of infection. The MSU1 isolate was the most virulent isolate followed by UI2 and KC1. Leaf and crown lesions caused by the three isolates were similar on all of the varieties. The experimental variety WTN-A 13 had the smallest percentage of crown-rotted and dead plants. Eighteen percent of the WTN-I-13 tillers were crown rotted or dead with the MSU1 isolate, 8 percent with UI2, and none with KC1. WTN-I-2 and Belturf were ranked next with slightly higher percentages of dead or diseased plants. The varieties P104, WTN-J79, and Fylking were the most severely affected. Fylking

please turn page



TOUCHDOWN*
...this Elite starts FAST.

Touchdown Kentucky Bluegrass is no slow poke on your fields or fairways. This new variety gives you the quick start not usually associated with Elites—and once it germinates it keeps right on growing sending out vigorous rhizomes and new shoots to quickly give you a turf cover that lets you breathe easy. Faster cover means fewer washouts and blowouts, less competition from moisture and nutrient robbing weeds and a more quickly established turf for sale as sod or play on fairways. Touchdown can be mowed short and its density means you can plant it right up on tees too. You'd expect this with Touchdown's pedigree.

Touchdown was discovered by a professional—Tom Rewinski—Course Superintendent at the famed National Golf Links of America on Long Island. It was first evaluated by Dr. C. R. Funk at the turf grass breeding program at internationally acclaimed Rutgers University. Since Rewinski's discovery, intensive evaluation there and at numerous other institutions Touchdown has received top turf quality ratings.

And it only stands to reason that Touchdown will be a lower cost management grass. More rhizomes and side shoots means growth is directed where you want it—not just mow, mow, mow. Greater levels of disease resistance means fewer costly fungicides and dense aggressive turf means better competition against weeds and Poa annua.

Professional Quality Seed of Certified Touchdown Kentucky Bluegrass is now available.

To find out how great Touchdown is—contact your distributor and try some.

*Plant variety protection applied for.

Produced and distributed by

PICKSEEDWEST, Inc.

Box 888, Tangent, OR. 97389 (503) 926-8886

Available from:

Lofts
Pedigreed Seed, Inc.,
Bound Brook, N.J. 08805
(201) 356-8700

Lofts/
New England,
Arlington, Mass. 02174
(617) 648-7550

Lofts
Kellogg Seed Co.,
Millwaukee, Wis. 53201
(414) 276-0373

Lofts/
New York,
Albany, N.Y. 12205
(518) 456-0042

...in Canada: Otto Pick & Sons Seeds Ltd.,

Box 126, Richmond Hill,
Ont. L4C 4X9
(416) 884-1147
Telex: 06 219623

Box 4, Grp. 200,
R.R. 2, Winnipeg, Man.
R3C 2E6
(204) 633-0088

Box 151,
St. Hyacinthe, Que.
J2S 5J9
(514) 799-4586

Fusarium Blight

continued

had the highest percentage of dead or crown-rotted plants with 85, 68, and 42 percent, respectively, for the three isolates. The varieties A-20, WTN-H-7, A-34, Merion, and WTN-A-20-6 were intermediate in their reaction to the three isolates.

FIELD STUDIES

Field studies were developed in an attempt to determine the usefulness of laboratory tests such as the tiller-puncture technique for the determination of the susceptibility of Kentucky bluegrass varieties to *Fusarium* blight. One study was conducted on a golf course fairway in central Illinois that had a history of severe *Fusarium* blight. Eight-inch plugs of nine Kentucky bluegrass varieties were placed in a severely diseased portion of the fairway in November, 1973. Three healthy plugs were placed together in each of three replications for each variety. These were allowed to root down and were mowed and maintained like the rest of the fairway.

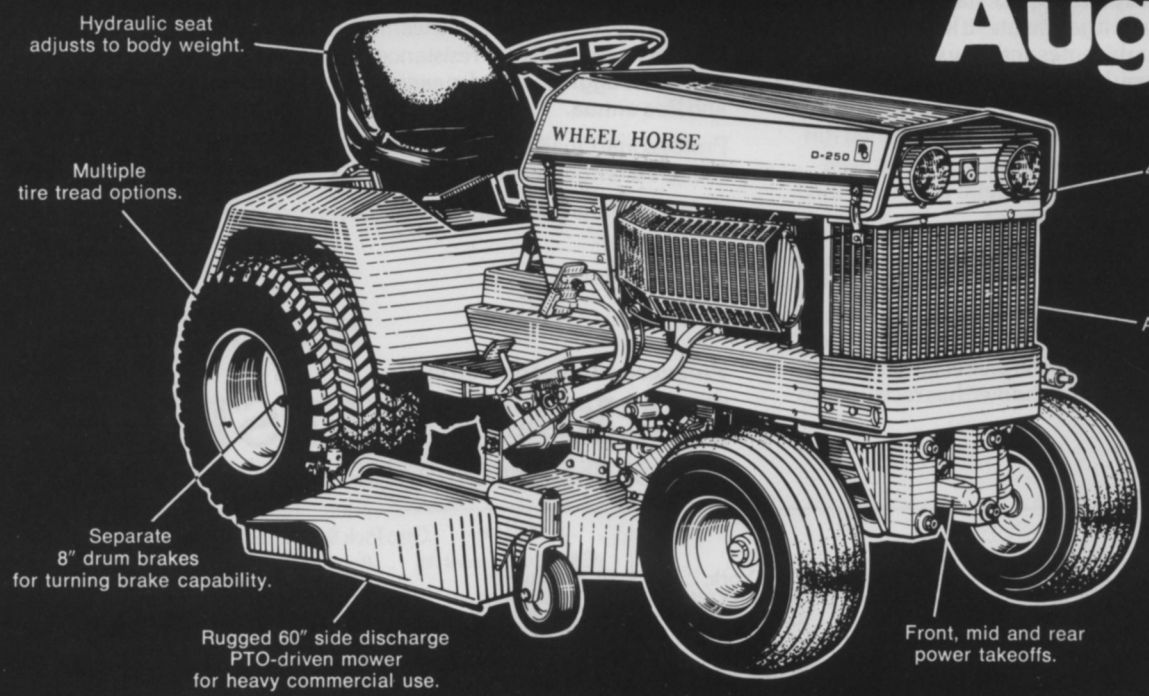
In the summer of 1974 *Fusarium* blight was not severe; all of the plugs were easily recognized and healthy except for Baron and Fylking, which were slightly thinned. During the summer of 1975 *Fusarium* blight was severe, and the varieties Fylking and Baron were severely damaged, as was the surrounding turf. The variety WTN-I-13 showed the least amount of damage with the varieties WTN-H-7, WTN-A-20-6, A-20, and WTN-I-2 ranking close behind. After two years the varieties WTN-I-13 and WTN-H-7 had grown laterally from the original 8-inch plugs, while the percentage of cover on the plugs of the other varieties had decreased in diameter. These changes, along with the difficulty in differentiating some of the plugs from the original fairway turf, made rating more difficult.

Another field study was initiated in the fall of 1974 in an area severely infested by *Fusarium* blight at the University of Illinois turf plots. In this test an 18-inch sod cutter was used to remove diseased sod to a depth of approximately 2 inches. Soil from a nearby field was used to fill these 18-inch strips back to the original grade and infested turf was left intact on both sides of the strips. Seed of 32 varieties, including most of the above-mentioned varieties, was then used to plant 3 replicated plots for each variety in plots 3 feet long in the 18-inch strips. *Fusarium* blight was severe in the turf surrounding the 18-inch strips, but the new seedings remained free of *Fusarium* blight during the 1975 growing season.

DISCUSSION

The variation in the virulence of the three isolates in the tiller-puncture test is similar to the variation

Put this Wheel Horse to work on your grounds by August 31


Hydraulic seat adjusts to body weight.
Multiple tire tread options.
Separate 8" drum brakes for turning brake capability.
Rugged 60" side discharge PTO-driven mower for heavy commercial use.
WHEEL HORSE
D-250
4-cylinder, 19.9 HP.
Sealed, liquid cooling system. Adds years of life to the engine and makes for extra quiet engine operation.
Front, mid and rear power takeoffs.

reported by other workers (3) with different *Fusarium* isolates. A limitation with the tiller-puncture test is that each inoculation is made with a single strain of the pathogen. Since the *F. roseum* and *tricinctum* species vary greatly in nature, a larger number of isolates need to be included in tests to increase their validity.

None of the varieties in the tiller-puncture test remained completely healthy. WTN-I-13 was the least severely affected variety in both the tiller-puncture and the field study. Other tests are needed in different locations with this variety to verify its degree of susceptibility to *Fusarium* blight. Some of the varieties that ranked intermediate in the laboratory tests also ranked intermediate in the field test. It should be noted that Merion was not the most susceptible variety in the test. The high degree of susceptibility of Fylking to *Fusarium* blight has been reported in different locations (5). The susceptibility of the variety WTN-J-79 at a level similar to Fylking is an indication that this variety may perform poorly in areas where *Fusarium* blight is severe. The tiller-puncture test with a limited number of isolates may be most useful as a method to detect a high degree of susceptibility in a variety before it is released. Many experimental and commercial Kentucky bluegrass varieties besides the 14 reported in this paper have been inoculated with the MSU1 isolate, using the tiller-puncture technique. To date, no variety has remained free of infection. It is hoped that this technique will at some time aid in detecting a source of germ plasm that has a high degree of physiological resistance to *Fusarium* blight.

LITERATURE CITED

1. Couch, A. B., and E. R. Bedford. 1966. *Fusarium* blight of turfgrasses. *Phytopathology* 56:781-786.
2. Endo, R. M. R. Baldwin, S. Cockerham, P. F. Colbaugh, A. H. Cain, and V. A. Gileault. 1973. *Fusarium* blight, a destructive disease of Kentucky bluegrass, and its control. *Calif. Turfgrass Culture 23:1-2.*
3. *Fulton, D. E., H. Cole, Jr., and P. E. Nelson. 1974. Fusarium* blight symptoms on seedling and mature Merion Kentucky bluegrass plants inoculated with *Fusarium roseum* and *Fusarium tricinctum. Phytopathology* 64-354-357.
4. Meyer, W. A. 1973. Tiller-puncture technique to artificially screen Kentucky bluegrass cultivars to *Fusarium* blight. Proc. of 2nd International Congress of Plant Pathology, 1975.
5. Turgeon, A. J., and W. A. Meyer. 1974. Effects of mowing height and fertilization level on disease incidence in five Kentucky bluegrasses. *Plant Dis. Reptr.* 58:514-516.
6. Vargas, J. M., and C. W. Laughlin, 1972. The role of *Tylenchorhynchus* in the development of *Fusarium* blight of Merion Kentucky bluegrass. *Phytopathology* 62:1311-1314.

Reprints Available

For reprints of this 14-page feature on *Fusarium* blight, contact Richard J. W. Foster, WEEDS TREES & TURF, 9800 Detroit Ave., Cleveland, OH 44107.

...and we'll give you a $500 cash rebate.

It's our way of introducing the one-of-a-kind D-250 to you.

If saving $500.00 on your next piece of grounds-keeping equipment is important to you, read on. Then, act quickly.

From now until August 31, we're introducing our top-of-the-line 19.9 HP, D-250 lawn and garden tractor to people like you.

Simply make the best deal you can with your Wheel Horse dealer on this 10-speed, liquid cooled, all purpose D-250. (He's listed in the Yellow Pages under "lawn mowers".)

Take delivery of a D-250 and mower by August 31, 1976 and send us this ad's coupon together with proof of purchase. Then, we'll send a $500.00 rebate check to you.

No hassles. Just a straight $500 cash rebate from Wheel Horse.

Act today.

WHEEL HORSE
lawn & garden tractors
515 West Ireland Road, South Bend, Indiana 46614

COUNT US IN ON YOUR $500 REBATE OFFER!

We have purchased and accepted delivery of a D-250 and mower on or before August 31, 1976. We understand that if our local dealer is out of stock on this unit, we may take delivery after August 31, 1976, and still claim our rebate, provided the unit was ordered by the dealer prior to that date. A receipted bill of sale is attached to this coupon. We have also enclosed a request for rebate on our institutional or company letterhead. We understand that Wheel Horse Products, Inc., will verify this sale in any manner it sees fit.

Serial Number of Tractor _____

Serial Number of Mower _____

Company or Organization _____

Street Address _____

City _____ State _____ Zip _____

Telephone Number _____

Authorized Signature, Title _____

TO BE COMPLETED BY SELLING DEALER:

Dealership Name and Dealer Code _____

Signature of Dealer _____ Date _____

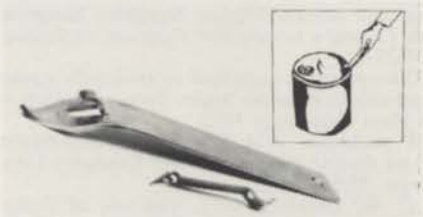
IMPORTANT: Completed claims must be postmarked prior to Midnight, September 10, 1976.

SEND TO: REBATE DEPT., WHEEL HORSE PRODUCTS, INC., 515 W. Ireland Rd., South Bend, IN 46614

Circle 141 on free information card

Products

Super Church Key may be the answer to more complete drainage of five-gallon liquid containers. Without complete drainage, significant quantities of expensive chemicals can be lost. In addition, the amounts of chemicals left in containers have the potential to create



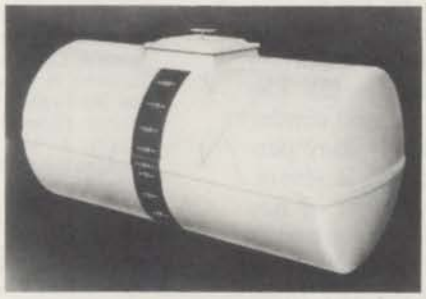
health and safety hazards. The key's long handle provides easy leverage. The company said it is four times faster than opening and pouring by conventional means. It empties the container more thoroughly. From Better Ideas, Inc.

Circle 701 on free information card

Mallinckrodt, Inc. has published a 34-page data booklet on its line of turf products. Included is information on turf colorant, fungicides, and growth retardants.

Circle 702 on free information card

Tanks in sizes from 60 to 500 gallons have been introduced by Hemco Corp. Tanks are made in halves then bonded together, enabling the



company to build the bottom half heavier where the tank is subject to most stress from saddle mounting, etc.

Circle 703 on free information card

A shredder-chipper from International Harvester can reduce tree limbs to chips in seconds. A special side hopper plus chipping blade design lets the user trade in tree

limbs up to three inches thick for valuable wood chips. The unit is powered by a seven-horsepower Briggs & Stratton engine.

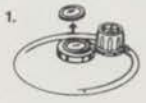
Circle 704 on free information card

BRANDT CAP CUTTER

THE-ALL-IN-ONE Chemical Can Opener

The Brandt Cap Cutter easily opens a five gallon drum of chemical as it cuts a circular opening in the plastic spout.

WE CAN Cut It· · ·



1. Use the uniquely designed hand bar built into the bottom of the cap to pry off the chemical seal.

2. Pull up the plastic spout and remove the drum cap.

3. As you twist on your Brandt Cap cutter, you are cutting an opening into the plastic spout, eliminating the need for knives, screwdrivers and other sharp instruments.

4. RESULT—A circular opening with no jagged edges - ready to pour - in 1/3 of the time.

and so can YOU

only $5.95

PAT. PEND.

Distributorships Available

Call Crown Today

& $UCCEED

Toll Free

1-800-325-3316

COMPLETE & MAIL WITH CHECK OR M.O.

YES I'd like to order _____ Brandt Cap Cutters at $5.95 each. Check or Money Order is enclosed. (Allow one week for delivery.)

COMPANY NAME _____

ADDRESS _____

CITY & STATE _____ ZIP _____

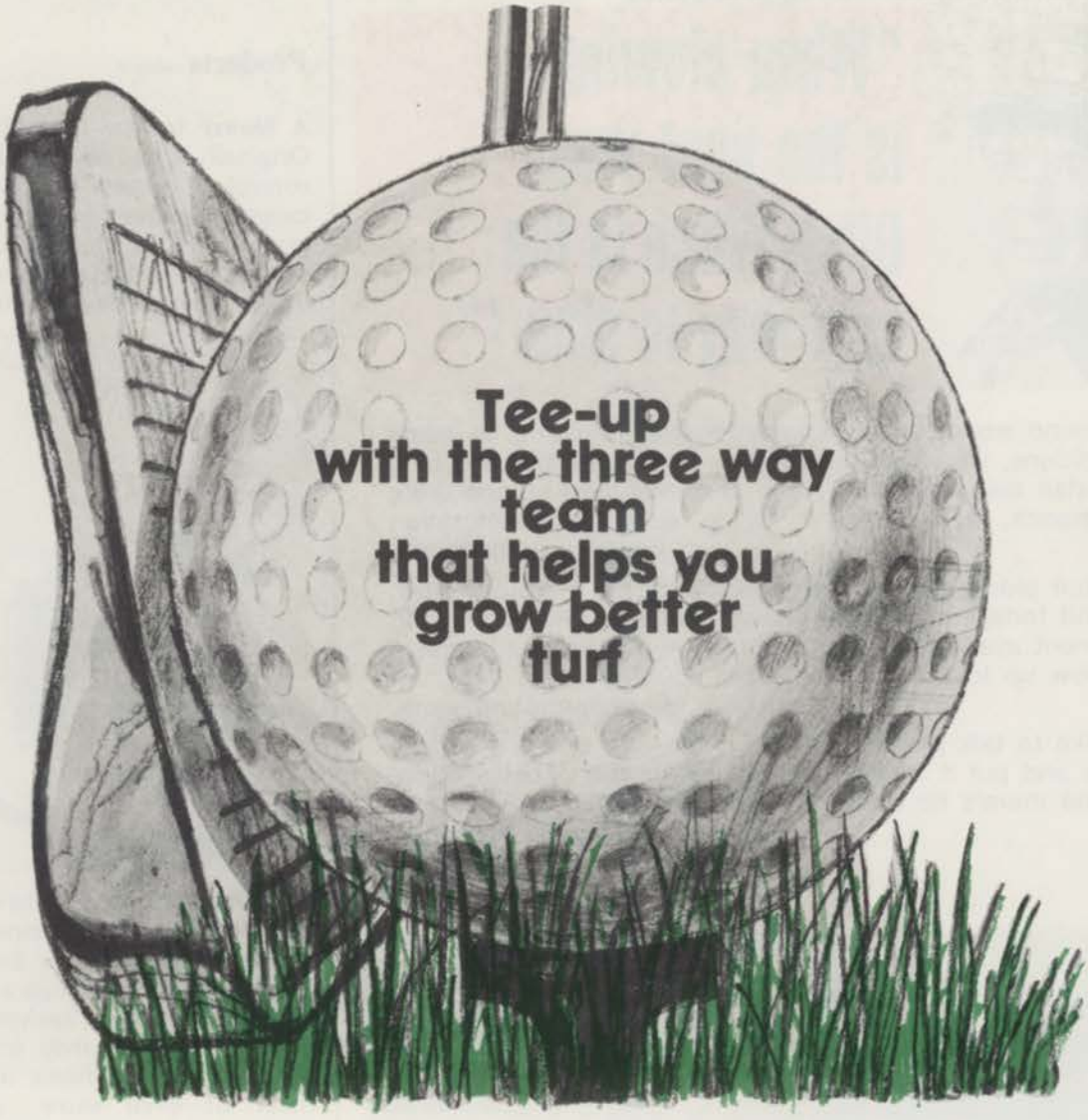
Mail to – CROWN CHEMICALS - 4236 Duncan Ave. - St. Louis, Missouri 63110

Circle 133 on free information card

A more comfortable operator is a more efficient operator. This is the aim of a modular cab for the line of articulated wheel loaders manufactured by J I Case Co. The pod-type cab is interchangeable for four loader models and is described as spacious with controls mounted for maximum efficiency. Modular in-

strument panels have warning lights as well as gauges for improved operator attention and protection of equipment. Standard equipment includes both a positive air pressurization system that is dust-resistant and offers extensive use of noise-suppression materials. Air conditioning, heater and defogger are options.

Circle 705 on free information card



KERB®, FORE® AND TRITON® CS-7

Three proven products from Rohm and Haas to make your job a little easier and your course or grounds more attractive. KERB 50-W herbicide stops Poa annua in Bermudagrass, can be applied anytime from pre-germination to seed formation. FORE fungicide protects turf and ornamentals from a wide range of fungus diseases including Brown Patch, Fusarium blight and certain other damaging diseases of turf. TRITON CS-7 wetting agent has been shown useful in removing dew from greens, and as an aid in increasing water penetration. Ask your chemical supplier for additional information on teaming up these products this year.

ROHM AND HAAS
PHILADELPHIA, PA. 19105

STRAIGHT TALK FROM YOUR DITCH WITCH MAN

"When plowing is the best way, Ditch Witch is the best way to plow!"

"Underground work doesn't always require trenching. In many soil conditions, vibratory plowing can be the fastest and best way to install many kinds of cable and even pipe. Since there is no trench, there's none to fill up, so a lot of restoration hours are eliminated.

Ditch Witch pioneered the development of the vibratory plow, and today we have the most complete line of plowing equipment available — ranging from the best small service plow up to the only big cross-country model designed exclusively for underground work.

We'd like to talk plows with you. We'd like to bring one to your job and put it through it's paces. It won't cost a thing, and there's no obligation. At Ditch Witch, we tell it to you straight!"

Call (800) 654-6481 Toll Free
for the name of the dealer nearest you.

Vibratory plow modules are available for Modularmatic vehicles in the 30-HP to 65-HP range.

Ditch Witch . . . equipment from 7 - to 195-HP.

CHARLES MACHINE WORKS, INC.
P.O. Box 66
Perry, Oklahoma 73077

DITCH WITCH ®

Circle 126 on free information card

Products *continued*

A blower is new from Stihl, Inc. Originally it was designed for use in control of insects and weeds because it can take liquids, powders or granules in its three-gallon reservoir. It has a maximum air velocity of 265 miles an hour coming out of

its nozzle, and people have found new uses for it, the company said. Its engine permits the dusting or spraying of trees as high as 35 feet and its compact backpack-type design makes it handy for use in cleaning sport stadiums of debris, litter or even snow. Another application is whitewashing.

Circle 706 on free information card

Industrial Lawn Vac from PeCo, Inc. has been designed specially for the John Deere 400 tractor to pick up and mulch leaves, grass clippings and other lawn debris. Used in large lawn maintenance programs, the unit can be operated without the driver leaving his seat.

Circle 707 on free information card

The Woodsman, a rugged machine that clears land by cutting a five-foot-wide swath through dense brush and trees, is described in a bulletin recently published by Royer Foundry & Machine Co. According to the bulletin, the unit can clear up to three acres of land in a day and easily handle six-inch-diameter trees.

Circle 708 on free information card

Pramitol 25E

Stops weed breakthrough.

Before you lay down asphalt, spray Pramitol® 25E. It'll keep weeds from breaking through your road, airstrip or parking lot pavement.

Not just for one year.

Pramitol controls weeds for about three years.

It works through a slow, naturally continuing process.

Rising ground moisture reaches the underside of the asphalt, forming little drops of water. Dissolving the Pramitol. And carrying it down to be absorbed by the germinating weeds.

Contractors and municipalities are finding that Pramitol has a working place in their 'specs'. In both asphalt and asphalt primer jobs.

If you'd like to know more about how Pramitol stops weeds from breaking through your pavement, drop us a line.

Agricultural Division, CIBA-GEIGY Corporation, P.O. Box 11422, Greensboro, NC 27409

CIBA–GEIGY

People on the Move

Officers of the *Hi-Lo Desert Golf Course Superintendents Association* are: Robert Reyes, Tri-Palm Estates, Thousand Palms, Calif., president; Roy Stoddard, Soboba Springs Country Club, San Jacinto, Calif., vice president; and Cal Caster, Palm Desert Greens, Palm Desert, Calif., secretary-treasurer.

Crown Chemicals, Inc., St. Louis, announces the appointment of Benjamin L. Lentz III to the newly created position of business representative for turf, sod, nursery and greenhouses. He holds a degree in biochemistry from the University of Missouri.

Larry G. Schmidt has been appointed field agronomist for the *Chevron Chemical Co.*, ORTHO Division, as announced by Dr. R. M. Thorup, national manager of fertilizer. Schmidt will provide agronomic support for district representatives in field testing and evaluation of fertilizers and fertilizer recommendations.

William J. Johnson, who has taught landscape architecture at the University of Michigan since 1958, has been appointed dean of *the University of Michigan* School of Natural Resources.

New officers of the *Wisconsin Landscape Federation* are: John Roeske, Grass Unlimited, Inc., New Berlin, president; Earl Wiggins, Wiggins Landscape Co., Milwaukee, vice president; and Ralph Christian, Mead Nursery, Inc., Oconomowoc, secretary-treasurer.

James F. Lang has been named to the position of district sales manager by the Outdoor Power Equipment Division of *J I Case Co.*, Winneconne, Wis. He will cover eastern Ohio, northwest Pennsylvania and West Virginia. Chris P. Melgar has been named to the position of district sales manager for New England.

Asplundh Chipper Co., Willow Grove, Pa., has announced a number of job changes: Larry Grocott is maintenance manager for the company's fleet of helicopters; Ed Cummings is vice president; Harold Duncan is Connecticut manager; Bill Eggers Jr. is manager for northern and central Pennsylvania; Paul Erickson is manager for Minnesota, North and South Dakota.

Russell M. Candee has been appointed manager of distribution sales of the Pipe Products Marketing Division and continues as a vice president of the *Johns-Manville Sales Corp.*, Denver, Colo. He was most recently vice president and national sales manager of the division.

Candee

Pegg

C. R. McMicken, president, of *B. Hayman Co., Inc.*, Waipahu, Hawaii, announced the appointment of Jack W. Pegg as representative in home offices. He was previously executive manager of golf for C. Brewer and Co., Hawaii.

D. W. "Dub" Gammon has transferred to the Dallas distribution center of *Thompson-Hayward Chemical Co.* as branch manager. The company is based in Kansas City, Kan. Gammon will be responsible for the sale and administration of the company's line of products.

Dennis R. Albaugh has joined *Thompson-Hayward Chemical Co.*, Kansas City, Kan. as an agricultural sales representative. He will be responsible for the sale of the company's line of agricultural products. His territory will be central Iowa.

James W. Adams, Irrigation Group vice president of *Toro Company*, Riverside, Calif., has announced a number of changes: Craig M. Tanner is director of agricultural marketing; Tanner's assistant will be Scotty G. Griffin, marketing representative — agriculture; William F. Thoele is group director of planning and controls.

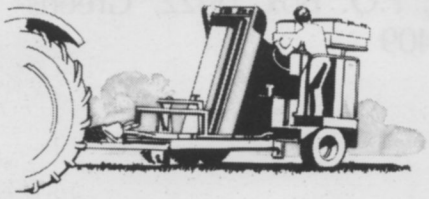
aerate
your lake or pond

- Prevents fish kills.
- Eliminates off odors.
- Adds life-giving oxygen.
- No maintenance—just pennies a day for electricity.
- Burns up pollutants which grow algae permitting fish life to flourish.
- Easy to install—comes complete—plugs into house current.
- Can be installed through ice.

For further details write

gen-AiRator
-KEMBRO
Box 205, Mequon, WI 53092
or call (414) 242-2630
Circle 148 on free information card

The "Tow-Boy"
SOD HARVESTER



- Under $10,000
- Up to 1500 sq. yds. pr./hr.
- 2 loaders—1 driver
- Hooks & unhooks in 5 min.
- Proven *low* maintenance
- Custom handcrafting

For brochure write or call collect:
2625 Johnstown Road
Columbus, Ohio 43219
(614) 475-8520

Princeton Manufacturing Company
Circle 149 on free information card

The Bel Air Country Club superintendent irrigates the whole course sitting down.

The J-M Binar® system gives him unique flexibility to match every condition on the course.

Beautiful Bel Air Country Club in Los Angeles had its problems. This world-renowned golf course had very little control of how much water went where. And when.

Widely varying areas needed different kinds of irrigation. Water drainage from steep grades flooded level areas. Greens were soaked or dried out. Hibiscus and pines received the same amount of water. Damage to private yards and streets bordering the course were constant worries.

But that's all changed since Bel Air installed a total J-M irrigation system, with flexible Binar controls, Buckner® sprinklers, and J-M PVC and Transite® pipe: the most advanced, computerized system available today.

Now the groundskeeper has the option of reprogramming every area, on a sprinkler-by-sprinkler basis, at any time of the day. And it all happens from a control panel in his office. Unless he wants to make changes out on the course, in which case he uses a portable control to override the central system.

That's unmatched flexibility! And it saves water, the groundskeeper's time and the club's money.

The conversion from the old system to the J-M pre-tested system was accomplished quickly, with a minimum of turf disturbance and without closing down the course.

For complete information about the flexibility of J-M turf irrigation systems with Binar programmers and controls, call Carroll Wood at (303) 770-1000, ext. 3330, or send the coupon.

Discover the ways Johns-Manville Technology can help you. With insulation. Pipe & irrigation systems. Mining & minerals. Building & roofing products. Filtration. Industrial products.

Johns-Manville

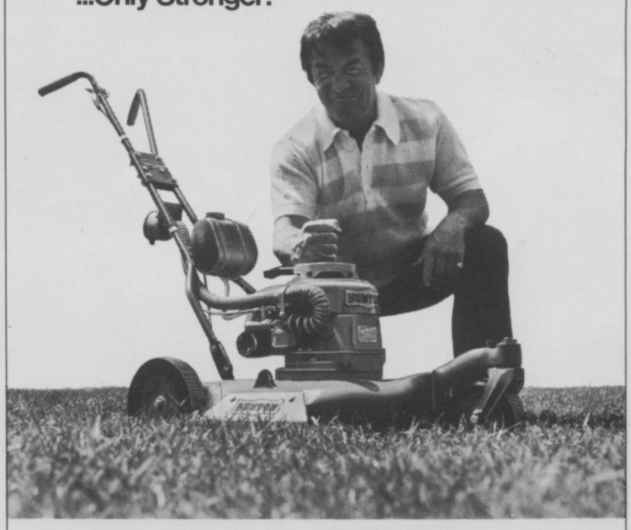
Johns-Manville
P.O. Box 5108-AT/41
Denver, Colorado 80217

☐ Please send me more information on J-M turf irrigation systems.
☐ Please have a J-M TECHspert call on me.

Name _____ Title _____
Firm _____ Phone _____
Address _____
City _____ State _____ Zip _____

BUILT LIKE A ROCK

...Only Stronger!



"Bunton lawn-turf equipment is built to take a beatin'... it's tough! Like this edger! Edger guards of heavy gauge steel, interchangeable and replaceable, prevent blade from marking or chipping and direct grass away from what it is edging." So listen to Rocky Graziano...send for more information today...with Bunton, you can't lose! Available from 8-inch to 52-inch cut.

BUNTON

BUNTON CO. 4303 Poplar Level Road, Louisville, Kentucky 40213, U.S.A.
Phone 502/459-3810 Telex 204-340

Circle 109 on free information card

Stop costly sprays from washing off

SPRAY STAY
STICKER-EXTENDER
CONCENTRATE

100% organic. Mixes easily—stays mixed.
Non-toxic to eyes and skin.

Write to: **NURSERY SPECIALTY PRODUCTS**
410 Greenwich Ave., Greenwich, Conn. 06830 • (203) 661-5840

Circle 110 on free information card

NEW! AQUAPROBE

Sub-Soil Moisture Tester

AQUAPROBE takes the guesswork out of soil moisture testing. Scientifically measures moisture at depths from 2 to 26 inches. No digging; no fixed point of measurement. Amazingly light-weight, portable and easy to use. Aquaprobe is low in cost, too. Write:

HOWARD S. CRANE, INC.
Oneida, N.Y. 13421

Circle 103 on free information card

Meeting Dates

Tri-State Golf Course Superintendents Association Meeting, Lakewood Country Club, Rockport, Ind., July 6.

Connecticut Nurserymen's Association Annual Summer Meeting, Holdridge Farm Nursery, Inc., Ledyard Center, Conn., July 6.

Wholesale Nursery Growers of America Summer Mem bership Meeting, Sheraton-Boston, Mass., July 10.

American Association of Nurserymen Annual Convention, Sheraton-Boston Hotel, July 10-14.

76th Annual Meeting of the American Society of Landscape Architects, Hotel de Coronado, San Diego, Calif., July 11-14.

Aquatic Plant Management Society Annual Meeting, Pier 66, Fort Lauderdale, Fla., July 11-14.

Golf Course Superintendents Association of New England, Joint Meeting with Rhode Island Golf Course Superintendents Association, Agawam Hunt, July 12.

Indiana Golf Course Superintendents Association Meeting, Tippecanoe Lake Country Club, July 13.

American Institute of Landscape Architects Regional Meeting, Santa Fe, N.M., July 15-17.

Rocky Mountain Golf Course Superintendents Association Meeting, Los Verdes Golf Course, July 15.

Midwest Association of Golf Course Superintendents Meeting, Exmoor Country Club, July 19.

Northern Michigan Turf Managers Association Meeting, joint with Michigan Border Cities Golf Course Superintendents Association and Western Michigan Golf Course Superintendents Association, Michigan State University, East Lansing, July 20.

Northern Ohio Golf Course Superintendents Meeting, Prestwick Golf and Country Club, July 20.

Greater Cincinnati Golf Course Superintendents Association Meeting, Fort Mitchell Country Club, July 20.

American Sod Producers Association Summer Convention and Field Days, Treadway Inn, Newport Harbor, R.I., July 21-23.

American Association of Nurserymen 21st Management Seminar, Colorado State University, Fort Collins, July 25-30.

Penn Allied Nursery Trade Show, Hershey Motor Lodge Convention Center, Hershey, Pa., July 27-29.

University of Massachusetts Third Annual Turf Field Day, South Deerfield Turf Station, South Deerfield, July 28.

Southern Nurserymen's Association Horticultural Trade Show, Marriott Motor Hotel, Atlanta, Ga., August 1-3.

Tennessee Golf Course Superintendents Association Meeting, Crockett Springs National Golf Course, Brentwood, August 2.

Tri-State Golf Course Superintendents Association Meeting, Evansville Country Club, Ind., August 3.

TURF TRUCKSTER SYSTEM.

Because the flexibility of the Cushman Turf-Care System saves you time and money. Here's how!

The System is built around the rugged, versatile 18 hp Turf-Truckster, 3-or 4-wheel model. With this one power source and options, you can haul, spray, spike, spread and top dress. And save as much as 35% on equipment in the process.

Because, instead of buying separately powered units for each job, you buy only the Turf-Truckster and the modular Cushman accessories you need. So you pay less in total for equipment... and have only one power unit to maintain.

CUSHMAN®
TURF-CARE EQUIPMENT

OMC-Lincoln, a Division of
Outboard Marine Corporation
6729 Cushman Drive
P.O. Box 82409
Lincoln, Nebraska 68501

But that's not all.

The System is also a time saver that can cut your labor costs. Accessories mount on the back of the Turf-Truckster. Your men do their work quickly, efficiently... and then move on to the next job at speeds up to 22 mph. There's less wasted traveling time, so you get more work out of each hour of labor cost.

The Cushman Turf-Care System. Versatility, superior performance, economy. It's a tough system to beat.

Write today for your free Cushman Turf Care Catalog.

You can't beat the system.

Meeting Dates *continued*

International Society of Arboriculture Annual Meeting, Stouffer's Riverfront Towers, St. Louis, Mo., August 8-12.

Professional Grounds Maintenance Society Annual Meeting, Greenfield, Village, Dearborn, Mich., August 9-13.

Georgia Golf Course Superintendents Association Educational Program and Business Meeting, Northwood Golf and Country Club, Lawrenceville, August 9-10.

Erosion Control Symposium for Erosion Control Contractors, Denver, August 9-10.

Symposium on Reclamation of Drastically Disturbed Lands, Ohio Agricultural Research and Development Center, Wooster, Ohio, August 9-12.

Indiana Golf Course Superintendents Association Meeting, Prestwick Golf Club, August 10.

Plant Growth Regulator Working Group, Baton Rouge, La., August 11-14.

Rocky Mountain Golf Course Superintendents Split Meeting, Colorado City, Cheyenne, Glenwood Springs, August 19.

Rhode Island Turfgrass Field Day, Turfgrass Research Farm, University of Rhode Island, Kingston, R.I., August 25.

International Symposium on Biological Control of Weeds, University of Florida, Gainsville, August 30-Sept. 2.

Pacific Horticultural Trade Show, Anaheim Convention Center, California, Sept. 11-13.

Fourth Arkansas Turfgrass Field Day and Conference, Country Club of Little Rock, Sept. 14-15.

Turf and Landscape Day, Ohio Agricultural Research and Development Center, Wooster, Sept. 14.

Indiana Golf Course Superintendents Association Meeting, Westbrook Elks, Sept. 21.

The Fertilizer Institute International Fertilizer Conference, Waldorf-Astoria Hotel, New York, Sept. 19-22.

Farwest Nursery Show, Memorial Coliseum, Portland, Ore., Sept. 22-24.

Northern California Turfgrass Council Turf and Landscape Irrigation Seminar, Asilomar Conference Grounds, Pacific Grove, Calif., Oct. 1-3.

Midwest Association of Golf Course Superintendents Meeting, Butler National Golf Club, Oct. 4.

The Fertilizer Institute International Fertilizer Conference, The Fairmont, New Orleans, La., Oct. 6-8.

Florida Turfgrass Association Management Conference and Show, Sheraton Hotel and Convention Center, Orlando, Oct. 10-14.

Indiana Golf Course Superintendents Association Meeting, Eagle Creek, Oct. 12.

Southern California Turfgrass Council 16th Annual Turfgrass Equipment and Materials Educational Exposition, Orange County Fairgrounds, Costa Mesa, Calif., Oct. 20-21.

Rocky Mountain Golf Course Superintendents Association Meeting, Willis Case Golf Course, Colorado, Oct. 21.

26th Central Plains Turfgrass Conference, Kansas State Union, Manhattan, Oct. 21-22.

Southwest Turfgrass Conference, New Mexico State University, Las Cruces, Oct. 21-22.

Wisconsin Golf Turf Symposium, Pfister Hotel, Milwaukee, Oct. 27-28.

Sixth National Institute on Park and Grounds Management Conference, Marriott Hotel, Atlanta, Nov. 8-10.

Indiana Golf Course Superintendents Association Meeting, Delaware Country Club, Nov. 9.

10th Annual Clemson Turfgrass Conference, Clemson House Hotel, Clemson, S.C., Nov. 9-10.

Missouri Turfgrass Conference, Ramada Inn, Columbia, Mo., Nov. 11-12.

Washington Aviation Association Convention, Spokane, Wash., Nov. 18-20.

Seventh Annual Georgia University of Georgia Turfgrass Short Course, Center for Continuing Education, University of Georgia, Athens, Nov. 22-23.

31st Oklahoma Turfgrass Conference, Oklahoma State University, Stillwater, Dec. 1-3.

FREE catalog of grounds care equipment

Full-color catalog shows the full line of Gravely lawn and garden tractors with accessories for mowing, grounds maintenance, gardening, snow removal, and more. Unique tractors feature all-gear transmission that Popular Science called "probably the world's most rugged small gear-type tractor drive."

Write or circle number on inquiry card

Authorized GSA
Federal Supply Schedule
GSA-07S-00768

GRAVELY®

3507 Gravely Lane
Clemmons, North Carolina 27012

Circle 107 on free information card

Proxol® 80 SP Insecticide
Stops These Turf-Marauders Before They Start.

Sod Webworm Cutworm Armyworm White Grub

Each sod webworm larva chews up 20 square inches of turf during its average life-span of 20 to 40 days. The cutworm larva can devour up to 36 square inches. Multiply this by the average 300 to 500 larvae generated from each adult in a 1½ to 3 week period and you begin to realize the damage these turf pests can cause.

But you can stop these insect predators *before* they start with Proxol 80SP, an organophosphate insecticide which provides fast, effective control of major turf and ornamental insects. Proxol 80SP acts as both a contact and stomach insecticide for combined quick-kill and residual activity.

With rising costs of maintenance and limited budget allocations, you *need* a sound pest *prevention* program of regular applications of Proxol 80SP to coincide with periods of peak insect activity.

For free color illustrated literature including lifecycles and spraying timetables, write:

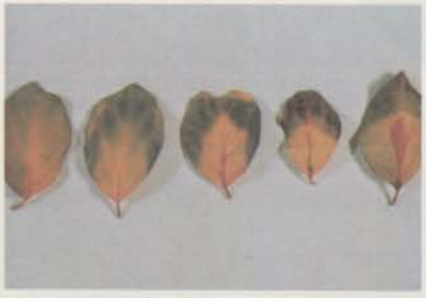
TUCO

Division of The Upjohn Company
Dept. 9510, Kalamazoo, Michigan 49001

Chlorotic azalea following seven weeks treatment with 5 ppm copper.

Plant on left received .032 ppm copper; the other, 5 ppm copper.

Wilting is a symptom of acute copper injury. Silver hairs were also prominent.



Basal chlorosis of cotoneaster caused by treatment for 10 days with 100 ppm.

Basal necrosis of cotoneaster caused by treatment for 10 days with 10 ppm copper.

Visual Symptoms Of Copper Toxicity On Woody Ornamentals

To aid nurserymen and landscape contractors in identifying copper toxicity on ornamentals, a series of tests were run by T. Davis Sydnor and Larry Kuhns of Ohio State University.

Copper toxicity symptoms have been recorded for a number of fruit and agronomic crops, but not for ornamentals. Ornamentals may also be subjected to high copper levels in several ways. Some factories emit copper-containing smoke. In these areas copper may be deposited on foliage or it may accumulate in the soil.

Repeated applications of fungicides, such as Bordeaux mixture may result in toxic copper levels in the soil. Finally, many woody ornamentals are sold balled and burlapped with copper treated burlap. Several growers have suggested that this treated burlap may be toxic to enclosed plants, for though they have not kept accurate records, they have claimed plants wrapped with copper treated burlap have a higher replacement rate than plants in untreated burlap. A study by the authors suggests this may be true for copper sulfate treated burlap, but not for copper naphthenate treated burlap. In all of these situations copper is especially troublesome because of its immobility in the soil. It is one of the most tightly held cations, so that only in very sandy or very acid soils can it be readily leached.

To aid nurserymen and landscape contractors in identifying copper toxicity on ornamentals, a series of tests were run to obtain visual symptoms of copper toxicity on several woody ornamentals. Spreading cotoneaster common boxwood and azalea were selected as the test plants.

Plants were selected from cuttings rooted in sand, transferred to a medium of acid-washed silica sand, and watered with a standard nutrient solution. Iron was supplied in the chelated form to prevent its precipitation from solution. The copper concentration in the nutrient solution was then adjusted with copper sulfate to vary from 0.032 ppm (control) to 8000 ppm. These copper levels caused two types of injury to the plants. At concentrations of 50 ppm copper and below, chronic injury was induced, resulting in the gradual decline of the plants. At 100 ppm copper and above, acute injury was induced, resulting in the sudden death of all plants.

Chronic injury. Chronic injury is the type injury which would most commonly be found on ornamentals. It was induced in azalea and cotoneaster by copper concentrations between one and 50 ppm, and in boxwood by five to 50 ppm. Generally, chronic symptoms were interveinal chlorosis and stunted growth, except for boxwood which did not become chlorotic but was simply stunted. The location of the chlorosis in azalea and cotoneaster was dependent on the concentration. Between one and five ppm chlorosis began on the new growth, while at 50 ppm bottom leaves became chlorotic first. The higher copper concentrations resulted in faster symptom expression. Chlorosis may have developed at lower copper levels if chelated iron had not been used, as it has been shown to alleviate the

effects of high copper concentrations. Surviving cotoneasters were pruned during the experiment, and this seemed to accentuate the problem. New growth was very severely stunted and chlorotic with five ppm causing all but terminal leaves to drop.

Chronic injury of the roots resulted in thicker main roots and fewer lateral roots. Dark stubs were prevalent that apparently were lateral roots which were killed before elongating. Necrotic lesions were common on affected roots which were also darker than healthy roots. At copper concentrations associated with chronic injury, high soluble salts levels were not a problem.

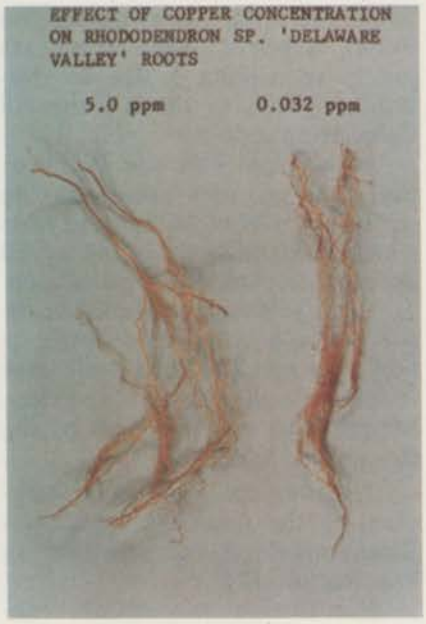
Acute injury. Copper concentrations of 100 ppm and above caused acute injury, but far exceed the amount of copper normally available to a plant. General symptoms of acute injury were wilting, dessication and death of all affected plants. The youngest leaves were affected last, but newly expanded leaves remained small and poorly developed. Other symptoms were species related.

Azaleas showed a gray discoloration of new leaves; and as the wilting occurred, the hairs on the new growth became very prominent and appeared silver. On cotoneaster and boxwood there occurred either a brown discoloration or chlorosis beginning at the base of the leaf and spreading outward until the leaves abscised. With copper toxicity, as opposed to water relations problems, the leaf margin is affected last. Lower leaves curled upward toward the stem, especially on boxwood, and some rosetting of terminal growth was evident. With boxwood only, leaf veins turned charcoal gray, beginning with the midvein and proceeding toward the margins. At copper concentrations of 1,000 ppm and above this occurred while the leaves were still dark green; at concentrations between 100 and 1,000 ppm the leaves and stems became chlorotic first.

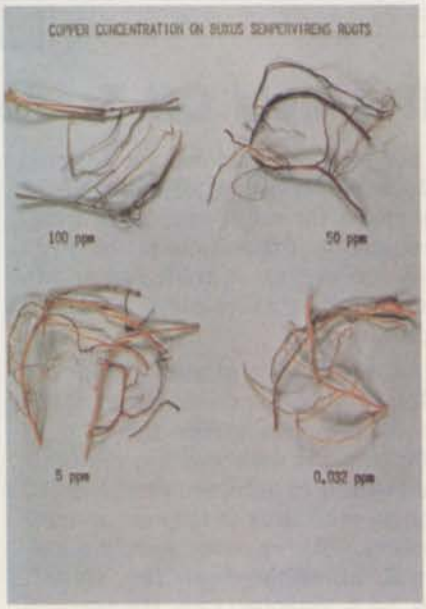
Acute injury was hard to define on the roots because the plants declined so quickly. However, darkened root tips, necrotic lesions, and some dessication were apparent when the plant roots were washed. Some of the described injury may have been due to root cell plasmolysis resulting from the high soluble salts level in the nutrient solutions containing high concentrations of copper sulfate. Root cell plasmolysis would lead to wilting, dessication, and death of plants, but it would not account for the translocation of copper to leaves, the gray discoloration of stems and leaves, or the basal leaf discoloration. It is believed copper toxicity and high soluble salts were both involved in the acute injury to roots.

Summary. Copper toxicity symptoms are very hard to distinguish from other nutrient, and some physiological disorders. Soil tests are generally unsatisfactory in determining a copper toxicity problem, as interpretation of the results depends on the analysis method and soil characteristics. Copper is toxic at much lower levels in a light sandy soil than in a soil high in organic matter or clay. High copper levels resulting from copper treated burlap are confined to the area around the burlap and would probably be missed by a soil test. Tissue analysis seems to be the only sure way to identify a copper toxicity problem, and it is complicated by the fact that a foliar sample is not accurate when looking for copper toxicity. Roots are the only tissue which accumulate enough copper to be satisfactory indicators of copper toxicity. Root copper levels of 30-150 ppm are normal, while anything above 200 may be considered toxic.

Finally, there are at least three means of overcoming copper toxicities of a chronic nature: Keep growing conditions for the plant as close to optimum as possible to eliminate environmental stress, fertilize with chelated iron, or increase the soil pH to precipitate excessive copper. □



Effect of copper concentration on azalea roots. Lateral branching is reduced by chronic copper levels.



Comparison of chronic and acute levels of copper on boxwood roots.

Chronic copper toxicity injury on boxwood roots. Necrotic lesions and undeveloped laterals are characteristic.

IRS Sets Off Trade Show Tremors

Late last year the federal Internal Revenue Service, after studying the question for seven years, ruled that non-profit organizations have to pay income tax on trade shows they run if selling takes place at the exhibitions.

Companies and attendees at the Golf Course Superintendents Show in Minneapolis earlier this year in Minneapolis were well aware of this ruling, due to a printed sheet handed out to exhibitors as they set up their booths. "We've never wanted a carnival atmosphere at the show," GCSAA director Lou Haines told WEEDS TREES & TURF at the time. No problems, the show went smoothly.

But there could be some repercussions at future shows in the green industry, according to a recent report in *Business Week*, which polled other associations. Many associations plan to have its staff pose as attendees and listen to the pitches of exhibitors to make sure no rules are being broken. Many exhibitors in some industries are dropping out because of the ruling.

Trade show sponsors in all industries are writing no-selling clauses into their contracts with exhibitors, insisting on posting of no-selling signs at the exhibitions, and urging that booths be manned by technical personnel rather than sales types. Long-used promotion literature about shows is being screened more carefully by association lawyers.

Some associations are even banning distribution of price lists and not allowing companies to pass out any kind of sample. But many argue that a trade show without selling may seem a contradiction in terms. The issue seems to be what actually constitutes selling. Many shows, for instance, have long banned booths that actually accepted cash on the spot and turned over merchandise. But the new IRS rules apply to any orders written at the show — even if they are subject to later credit checks and similar contingencies.

Some say this is discriminatory against smaller companies in the industry because they look at the shows as the only way to offset the advantage companies with large sales forces have.

Order writing can still go on, of course, as long as it is not at the show, so hospitality suites are expected to get a greater-than-usual workout. It is still not clear, however, whether suites provided to exhibitors by the show's sponsor can be used for such purposes.

The IRS rules leave companies the option, of course, of going ahead with a selling exhibition and simply paying taxes on the surplus from the part of the show where orders are written. Informal figuring by one association indicates that a surcharge of about $5 per booth would cover any tax liability.

ALCA Seeks CLCA Merge For Problem Solving

The American Landscape Contractors Association (ALCA) seeks to interest the California Landscape Contractors Association (CLCA) into forming a united organization.

The largest and oldest landscape contractors organization in the U.S., CLCA draws leadership from 700 landscape contractor members representing small concerns to interstate groups of massive businesses. Its 60 member board of directors is larger than membership figures for some states, according to the Landscape Industry Council of Colorado.

The purpose of the merger is to better deal with the groups' problems and to provide better answers. Both groups have remained separate since their founding in the 1940's.

Wally SaBell, a director at large for ALCA, and Duane Nelsen, president of ALCA, are coordinators for the proposed merger.

Fall Set as Release Date For EPA Pesticide Review

Review and classification of "those products which are most agriculturally used and important and classified for restricted use" will be completed by the EPA by September.

Only private and commercial applicators will be allowed to make "restricted use" applications. Chemicals classified as "general use" can receive application by the general public. Almost one half of the states now have EPA-approved plans to certifying applicators for marking "restricted use" applications.

Green Section Conference Moves to Atlanta in 1977

The annual United States Golf Association Green Section Conference will be January 28 at the Hyatt Regency, Hotel, Atlanta.

The subject of the conference is "Great Golf Courses of America — What Makes Them That Way". The scheduling of the annual meeting away from New York City is a departure from tradition; only in 1958, when it was in Chicago, was it held outside of New York.

Tree Organizations Sponsor Bicentennial Tree Programs

The International Society of Arboriculture (formerly International Shade Tree Conference) and the National Arborist Association are jointly sponsoring a tree recognition program for the Bicentennial Celebration.

In keeping with the Bicentennial, the groups are honoring significant trees of 200 or more years which are standing today as they did during the American Revolution. To qualify, the person must sponsor a tree by sending documentation of its age. The Society will issue bronze plaques to the sponsors. Members or non-members of the two groups are eligible.

The program is officially recognized by the American Revolution Bicentennial Administration in Washington, D.C.

For further information, contact the International Society of Arboriculture, P.O. Box 71, Urbana, Illinois 61801.

please turn page

INTERNATIONAL SOCIETY OF ARBORICULTURE

(formerly International Shade Tree Conference)

FIFTY-SECOND ANNUAL CONVENTION

Stouffer's Riverfront Towers, St. Louis, Missouri

August 8-12, 1976

Convention — 1975

EXHIBITION AND DEMONSTRATION OF TREE PRESERVATION EQUIPMENT TOOLS and MATERIALS

Address communications to E.C. Bundy, Executive Secy.
International Society of Arboriculture
P.O. Box 71, Urbana, Illinois 61801
Tel. AC (217) 328-2032

Golf Foundation Names Griffin Southwestern Regional Director

Holman M. Griffin, a national authority on turf management, will serve the National Golf Foundation as regional director for Texas, New Mexico, Oklahoma, Arkansas and Louisiana.

He brings 15 years of experience with the United States Golf Association Green Section to his job and has an agronomy degree from Texas A & M University. While working for the Green Section, he held positions in the South, Southwest and Northeast and has directed the USGA Green Section's Mid-Atlantic region since 1971. He also has written numerous turf management articles.

As regional director, Griffin will also be part of NGF's expanded workshop program this year.

T38 3 UNIT GANG SAFETY MOWER

9 FOOT SWATH
24 HP
FOR ACREAGE MOWING

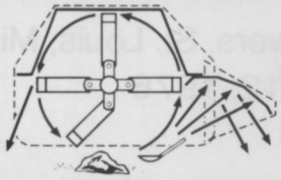
MOWS FINE LAWNS
SHREDS HIGH GRASS & WEEDS
HIGHLY MANEUVERABLE
AROUND TREES & SHRUBS
WORKS IN ROCKS & TRASH
IN CONDITIONS WET OR DRY

COSTS LESS
DOES MORE
THAN ANY OTHER
GANG MOWER
IN ITS CLASS

mott® HAMMER KNIFE®

FOR 28 YEARS

MOTT CORPORATION
514 SHAWMUT AVE.
LA GRANGE, IL. 60525
(312) 354-7220



LOW IMPACT FORCE ACTION of the MOTT lightweight free swinging flail knives, their vertical mode of operation, the guard action of the anti-scalp bar and the deflecting features of the cutter housing all combine to make the MOTT HAMMER KNIFE flail mower by far the SAFEST of all impact action mowers.

For the Cost and Safety Conscious who want Best Value Purchase!

MOTT FLAIL MOWERS

USE ANY TRACTOR 8 to 10 HP UP.

Circle 135 on free information card

Future of Maple Trees Threatened by Disease

The maple tree is in serious decline throughout the Midwest, according to Alden Townsend, a geneticist at the U.S. Forest Service laboratory at Delaware, Ohio.

"Affected maples virtually stop growing," the scientist said. "Their leaves break off and they begin to look a little unsightly. They also drop their leaves earlier in the fall." The decline of the maple is so recent that forestry scientists are uncertain about the outlook for the species.

"They will hang on for 10 or 15 years," Townsend said. "First, we thought it was confined to just the sugar maple, but then we found it was happening to the red maple too." The red maple is used more for shade and ornamental purposes. Scientists are working at a number of laboratories to identify the cause of the maple tree decline. There appear to be several causes, at least.

Scientists at the Ohio Agricultural Research and Development Center in Wooster recently identified verticillium wilt, a fungus disease, as the cause of affliction of some maples. Scientists at Michigan State University have identified manganese deficiency in the soil as an additional cause.

Other scientists believe salt used to melt ice from roads is damaging the maples. A scientist at the United States Department of Agriculture laboratory at Delaware is seeking to identify a virus believed to be the cause of another maple tree problem — the curly or birdseye grain. Such a figure is considered a defect in maple wood used for furniture, although it adds to the value of the wood when used for fancy firearms stocks.

Researchers at the University of Michigan are experimenting with various remedies, including fertilization of afflicted maples and the administering of manganese, fungicide and even tetracycline, an antibiotic commonly prescribed for humans. None of the treatments have been particularly effective. Townsend suggests deep watering of the trees and a fertilizer comprised of equal parts of nitrogen, potassium and phosphorous to ward off the infection.

please turn page

MEDALIST 5®

The concept of the future in a turfseed formula for today.

As costs rise and the margin for error shrinks, the trend in turf management is toward the balance and security of the blend concept.

With the Medalist blends for winter overseeding, Northrup King has been working toward the future for a long time. Now our work pays off in the Medalist Brand 5 formula with Pennfine Perennial Ryegrass, probably the best wintergrass available today.

In Medalist 5, Pennfine is combined with other improved fine-leafed varieties. They've all been play-tested in formulas on golf courses throughout the South. Careful testing under playing conditions has been part of the Northrup King blend approach from the very beginning.

To find out how the concept of the future can work for you this winter, write: Medalist 5, Northrup, King & Co., P.O. Box 370, Richardson, Texas 75080 or P.O. Box 29583, Atlanta, Georgia 30329.

NK NORTHRUP KING®

Circle 125 on free information card

Portable Power For Hyd. Tools

Causco
Power/Pack

The Causco Power/Pack makes it easy, economical to use hydraulic chain saws, circular saws, pruners, paving breakers, tamps -- anywhere! Write today for full details on this low-cost power source for low-maintenance, labor saving hydraulic tools.

Causco INC.

P. O. Box 1921
Independence, MO 64055

(816) 254-9850

Circle 132 on free information card

OSHA an Agency in Disarray, Ready for a Major Overhaul?

The federal Occupational Safety and Health Administration (OSHA) is in difficulty and disarray, beset with a host of legal, research, standards and enforcement problems. It also is subject to political pressure, say its critics and is beset with internal dissension, according to a recent report in *The Landscaper*, official publication of the Illinois Landscape Contractors Association.

"The muddled agency has the power to regulate industry, however, and must be reckoned with," the report said. "Reports that OSHA will fold its tents and go away are grossly exaggerated."

To cite one problem which besets the agency, OSHA's standards — particularly chemical manufacturing standards — are constantly under attack. OSHA lawyers are constantly in federal court defending the agency and its work. In most cases to date, OSHA standards have not held up under judicial scrutiny. When after legal challenges to standards have been heard in federal court they are remanded, they must go through the whole OSHA procedure again, including more scientific review, revision by standards writing department and legal review. After that, the revisions are subject to hearings where OSHA gives industry and the unions their chance to air objections and propose their own amendments. Finally, back to court they go.

The process can take months, the report said, even years, and all departments of OSHA are overwhelmed with the flood of material and subjects with which it must deal. While it wrestles with these problems and fences with industry's lawyers and labor lawyers, OSHA also has to contend with the government's Office of Management and Budget (OMB). Before issuing a standard, the agency has to file with the OMB an "inflation impact" statement.

The OSHA people find this particularly irksome. The agency head, John Stender, points out that "it's easy to count up capital costs that industry may incur to comply with a standard. But it is not so easy to add up the economic benefits — such as lower workmen's compensation costs and lower costs for a community to care for an injured worker's family."

Even as it picks its way through the standards-setting maze, OSHA is confronted with a problem that could make all its other problems academic: its field enforcement scheme shows signs of falling apart.

OSHA's goal was to return much of its enforcement effort and power to the states. Twenty some states, however, have not won federal approval of their inspection and enforcement programs, for which the federal government pays half. New Jersey is trying to turn the whole thing back to the federal agency, and many states, including New York, are finding money a serious problem.

If more states pull out, the burden on inspectors working from regional offices will become intolerable, insiders say. The prospect of weaker enforcement and lagging standards leads to speculation that young OSHA is already in for a major overhaul.

please turn page

Circle 116 on free information card

Is your new bluegrass plagued with weeds?

FYLKING IS PURE.

The famous Swedish beauty, Fylking Kentucky bluegrass seed contains no annual bluegrass *(Poa annua)*, bentgrass or short-awned foxtail. Strict controls and countless inspections guarantee the physical purity and genetically true seed typical of Fylking Kentucky bluegrass. These procedures make your seed dollars go farther. Fylking is one of the lowest priced elite bluegrass seeds on the market.

Fylking, used as the backbone of your seed mix, will produce a lawn that will make you proud. Fast germination and growth, development of a dense, compact rhizome and root system, make Fylking a natural choice. Low-growing, low-mowing (low as 1/2 inch), more disease, drought, smog and traffic resistant. Fylking is persistent, brilliant green from early spring to late fall.

For a purely beautiful, tough turf, specify Fylking Kentucky bluegrass. Available at your local wholesale seed or sod distributor.

FYLKING KENTUCKY BLUEGRASS

U.S. Plant Patent 2887

Another fine quality product of Jacklin Seed Company.

Fylking plants started from "original" breeder's seed in sterile greenhouse media are transplanted to fumigated soil in isolated breeders block for seed increase.

Individually harvested, progeny seed from each original "mother plant" is cross tested for genetic purity. Physical and genetic purity are carefully maintained by constant evaluation, chemical spot roguing and physical removal.

Your Image Is Important Landscape Contractor Says

Landscape contractors and other green industry businessmen must be concerned about their image because it is a powerful influence on where their business is going, according to Ralph Little, Geneva, Ill., and president of the Illinois Landscape Contractors Association.

"I am often amazed at how may horticultural-related retail companies have such a poor image at their place of business," Little told WEEDS TREES & TURF. "You have seen them: the landscape contractor whose sign is faded and falling down or crudely done, or nonexistent; the one whose headquarters is a dilapidated building, weeds growing about rusty, discarded equipment and in general has paid no attention to the fact that he is selling beauty; the garden center that looks more like a used-furniture or second hand store.

"No, I'm not objecting to stacks of mulch, peat moss and the like; I am objecting to a cluttered, littered place, with no real definition of areas such as parking, sales, etc., and with poorly maintained buildings and equipment," he said.

He suggested that if a business has a location that reflects neglect and little commitment to aesthetic beauty that it will attract bargain hunters, the types of customers who shop on price alone. He said many tend to overlook eyesores, and often taking pictures will show you more clearly what the public sees.

Course with More Than 60 Is Over-Trapped — Finger

Any course that has more than 50 or 60 traps is probably overtrapped, and the course should have a study made to determine whether unnecessary bunkers can be eliminated, according to golf course architect Joseph Finger. He spoke at the United States Golf Association Green Section's annual conference on turf management earlier this year in New York.

"There is also the possibility of creating grass bunkers instead of sand traps," he said, "and as any player will tell you, high grass is much tougher to recover from than a sand bunker. In the fairway areas, I prefer to use 'tree traps' instead of sand traps, except for 'picture' holes."

He said some superintendents say it costs from $50 to $150 a year to maintain a bunker. On a course with 80 to 100 bunkers, this becomes a substantial item. The club and its architect should first take a good look at reducing the number of bunkers, particularly those that are only in the way of the average golfer and do not necessarily hinder the low-handicap golfer.

"I will have to admit that there is hardly anything prettier on a golf course than dark green grass and white sand, particularly in irregular patterns," he said. "If the object of your program in redesigning your greens or course is to make beautiful pictures for the magazines, then I suggest you use big, long bunkers from tee to green or extending 30 to 40 yards out in front of the greens. They will make beautiful pictures, especially if you take them from a plane. But they make expensive courses and slow play. If the bunker is designed properly it will not be cut so steeply that either the golfer cannot take his stance, or the sand is beyond its natural angle of repose where it will slough at the slightest movement of wind, water or vibration."

He said there is usually no agreement between a superintendent and a golf course architect when it comes to traps. The superintendent wants a bunker which is so shaped that it is very easy to mow around. The architect, in trying to please the membership, has to design what are often referred to as "character" traps with all the little "walk-outs" or "tongues" and irregular shapes reminiscent of the old Scottish courses or links, but universally used where the "pretty picture" impulse is predominant. "So, if you want 'character' bunkers you had better be prepared to pay for the maintenance," he said.

Ciba-Geigy Seeks Label For New Turf Insecticide

An organophosphate insecticide for turf — CGA 12223, will be field-tested in liquid and granular form when Ciba-Geigy Corp., Greensboro, N.C. receives an experimental permit.

The insecticide controls grubs, chinch bugs, sod webworms, bermuda mites, mole crickets and nematodes, the company said. All types of commonly grown lawn and commercial turf will be included in the research.

Tests have been underway at company research farms and at universities for several years. The company hopes to apply for registration on turf in time for the 1978 season.

Plants in the Landscape Covered in New Volume

Plants in the Landscape, an introduction to the principles and practices of ornamental horticulture in landscape architecture, is available from W. H. Freeman and Co., 660 Market St., San Francisco, Calif. 94104.

The book was written by Philip L. Carpenter, Theodore D. Walker and Fredrick O. Lanphear. Carpenter is associate professor of horticulture at Purdue University; Walker is associate professor of landscape architecture at Purdue; Lanphear is manager of instruction of the Texas State Technical Institute, Amarillo.

Circle 113 on free information card

Tax-Supported Agencies Pose Threat to Contractors

Increasingly, private contractors are facing competition from a new front — organized municipal and tax-supported agencies pursuing the practice of "force account."

In force account, these groups use their workers for construction on outside accounts. The result: competitive bidding is bypassed, private contractors are frozen out of work and contracts, and unnecessary expense hits all taxpayers, whose taxes sustain the agencies.

Landscape and irrigation industries are especially threatened. According to the Landscape Industry Council of Colorado, some $220,000 has been diverted from industry in Denver to the agencies over the past six months.

It is much the same in California. An example is a landscape and irrigation contract awarded to municipal workers in San Marcos, San Diego County, which halted a project costing $243,000 over three years. The action was in direct violation of a state statute which usually requires bidding by private concerns on public work projects in excess of $3,500.

Besides involving the misuse of tax monies, force accounts also impair private enterprise systems and cost clients extra expense. In Colorado, one agency convinced residents to buy unneeded and costly equipment for its project, just to see the tools fall into disuse and rust.

Industry is taking steps against the situation, however. In the San Marcos case, private contractors successfully stopped the municipal effort through the courts. The decision in favor of the contractors was not appealed.

Spruce Budworm Attack Taking Place in Maine

An aerial insecticide spray program to combat the spruce budworm is taking place on 3½ million acres of Maine forest this spring and early summer.

The project is a joint effort financed by the U.S. Forest Service, the State of Maine and paper companies owning land in the area. Project sponsors estimate that five to seven million acres of Maine forests are infested by the spruce budworm, and 3½ million acres are infested severely enough to threaten the immediate survival of the trees. The objective of the program is to control the budworm and prevent defoliation to the point that trees in the severely infested areas can survive. Project leaders hope to obtain better than 90 percent insect control and better than 30 percent foliage protection.

Sevin 4 Oil carbaryl insecticide, a Union Carbide product, has been chosen for the spray program. Officials said the decision to use this material was based upon the product's availability and its performance in a 500,000 acre program in Maine in 1975. This program demonstrated the product's extended residual properties, capability of being handled efficiently in large scale programs, insecticidal activity and foliage protection effectiveness.

The material has been evaluated by state and federal forest and regulatory agencies and meet environmental criteria which they have established for the project.

The company is shipping 648,000 gallons to Maine for the program. The material is being formulated at facilities in Memphis, Tennessee and Elkton, Maryland.

The spruce budworm has been a problem in Northeastern forests for many years. An infestation in the early part of this century destroyed 27,000,000 cords of spruce and fir timber.

Today the budworm threatens to severely hamper Maine's pulp and lumber industry.

please turn page

Circle 120 on free information card

TRELAN

"Whole Tree Chipper"

New forward discharge spout designed for the tree services.

"Trelan is the machine I've dreamed of for years."

Robert Klausing
Klausing Tree Service
New Lenox, Ill.

STRONG
MANUFACTURING COMPANY

498 — 8 Mile Rd., Remus, Mich.
Phone (517) 561 7591

Circle 131 on free information card

Little Future for Fairways Of Bluegrass, USGA Says

There is not much of a future for bluegrasses on golf course fairways, in the mid-Atlantic region of the country at least, according to Holman M. Griffin, former director of that region for the United States Golf Association Green Section, now with the National Golf Foundation.

At least with the bluegrass strains now available, the disease *Fusarium roseum* is a major problem along with insects such as *Ataenius spretulus* and others, he said as part of a panel discussion at the Section's annual conference on golf turf management earlier this year in New York.

Stanley J. Zontek, USGA director, "There is no doubt we do have problems with bluegrasses. Bluegrass is being forced to grow at too low a cutting height with too much nitrogen, too much water and maybe not enough other good maintenance practices, such as liming and aeration. But the researchers are continually trying to improve bluegrass strains, to improve disease controls and to develop better insecticides. I think there is a great future for bluegrass progress simply by sorting out the tremendous amount of information already available on diseases, insects, etc."

Carl Schwartzkopf, USGA director, said, "In the mid-continent, the failure of bluegrass has always probably been due more to cutting height than anything else. The superintendent is being forced to cut bluegrasses too short, and this places undue physiological stress on the plant. There is also the tendency for some to overwater in order to maintain *Poa annua* during the summer.

"Unfortunately, many golfers believe green is good and brown is bad. When everyone realizes the capabilities and management requirements of bluegrass, I think bluegrass will probably do very well. I have played bluegrass fairways that were cut at 7/16 inch. When I mention this to some people, they simply shake their heads in disbelief. But those bluegrass fairways were so dense, it was almost like hitting a ball off Bermudagrass fairway turf. They were excellent. But we simply do not have bluegrasses available today that will very long survive the ¾ inch or less height of cut."

National director Al Radko said, "I do not think we should allow bluegrasses to be knocked out of the turf manager's box. Today, there are a number of excellent bluegrasses being developed by researchers like Dr. Joseph Duich of Penn State and Dr. Reed Funk of Rutgers. These bluegrasses will one day be equal to our other good grasses for fairway turf. They will survive a height of cut desired by most golfers. We are definitely working our way down to this point."

California Superintendent Takes on GCSAA Bylaws

There is a biased situation in the membership bylaws of the Golf Course Superintendents Association of America, according to a letter published in a recent newsletter of the Southern California Chapter of that association.

"There are many young, professional people in the field who have much to offer the GCSAA, but without association voting rights their voices cannot be heard," the unsigned letter said. "The membership laws are blind to professionalism. The bylaws stress quantity and negate quality. According to these regulations, as long as one puts in his time as a superintendent or assistant he can attain class A and B membership.

"I must point out at this time that I am by no means criticizing the vast majority of reputable superintendents," it continues.

He said the quality of the golf course where a person puts in his "time" has nothing to do with his membership classification. He suggests that as an example, if he had foregone his university education and had rather accepted a position at a pitch-and-putt, nine-hole sand course, by now he would be a class A member instead of a class F member.

He proposes that substantial experience credit be allowed persons with an applicable degree, and that a person with a four-year degree be permitted to take the certification exam upon graduation. Certification could be given after a few years of experience as a superintendent.

"If major changes cannot be made in our bylaws, perhaps it is time for a Professional Golf Superintendentts Association," he said.

Circle 121 on free information card

Circle 124 on free information card

Classifieds

When answering ads where box number only is given, please address as follows: Box number, c/o Weeds Trees and Turf, Dorothy Lowe, Box 6951, Cleveland, Ohio 44101.

Rates: All classifications 50¢ per word. Box number, $1. All classified ads must be received by Publisher the 10th of the month preceding publication date and be accompanied by cash or money order covering full payment. Mail ad copy to: Dorothy Lowe, Weeds, Trees & Turf, P.O. Box 6951, Cleveland, Ohio 44101.

USED EQUIPMENT

FOR SALE: 2 used aerial baskets — 50 ft. working height, 2 Asplundh brush chippers. Bean sprayer, 35 G.P.M. Vermeer stump cutter 1560. Parkway Tree Service, Milwaukee, Wisconsin. Phone 414 257-1555.

USED HYDRO-AXS, 52 ft. skyworker, cranes, tree spades. One year old Mohawk chipper model 18, Prentice loader on Mack truck (new). Call Jeff Gould, P. C.Gould Sales Co., Box 178, Essex, Conn. 06426 (203) 767-1636 for used equipment in the tree and landscape fields.

1975 MODEL 500 HYDRO axe, brand, new, less than 150 hours, has all extra features including air condition, $40,000.00. Call 914 895-3495.

HEIL ELEVATOR for loading roll sod. Worthington 5 gang mower. Rogers sweeper P.T.O. drive. Ford 7 ft. flail mower. 2 — Ryan 18 inch sod cutters. Ryan 18 inch sod rolling machine (antique). Write W. C. Gunn, R1, Holt, Michigan 48842 or call 517 694-6891.

FOR SALE 1966 Asplundh aerial lift with chipper box. Phone 707 459-2013.

SEVERAL 50 FOOT SERVI-lifts mounted on GMC trucks. Call 401 725-2250.

FOR SALE 1972 Waynes brush chipper, 16 inch. Less than 1000 hours, perfect shape. Klausing Tree Service, New Lenox, Illinois 60451. Phone 815 485-8488.

SEEDS

SOD QUALITY Seeds Merion, Fylking, Delta, Park, Newport, Nugget, Adelphi, Cheri, Glade and Baron bluegrasses also fine fescues. Manhattan rye grass. Custom mixing available. Michigan State Seed Co., Grand Ledge, Michigan 48837. Phone 517 627-2164.

HELP WANTED

GENERAL MANAGER, SOD FARM. All you have to be is imaginative, yet practical; energetic, yet thorough; growth- and production-oriented, yet able to work well with others; technically knowledgeable, yet able to step in and sell; profit-tuned, yet always conscious of the quality of our product. In other words, a shirt-sleeve manager who knows how to work, and how to get others to work; who believes in profits and results. You should have at least ten years of experience in growing and production on a sod farm, and you should be interested in running a farm that produces around 800,000 yards a year located in the Northeastern U.S. We offer a very special salary structure — ranging from $18,000 to $28,000, depending on ability and results — for a very special person. Our people know of this ad. Send your resume in strictest confidence, to Box 151, Weeds, Trees & Turf, Box 6951, Cleveland, Ohio 44101.

YEAR ROUND WORK — A.A.A. Tree Service, Inc., of Florida. Looking for experienced top notch climbers to work by the hour, on percentage, or under franchise in areas of Florida. Also needed-older men with sales ability. Henry Hardy, Jr. P.O. Box 6173, Orlando, Fla. 32803. Phone 305 339-5242.

YEAR ROUND WORK A.A.A. Tree Service, Inc. of Florida. Looking for experienced top notch climbers with or without truck and equipment to work by the hour, on percentage or under Franchise in Florida areas. Also needed older men with sales ability. Mechanic with chain saw experience. Man to operate his own tree spade. Henry Hardy, Jr., P.O. Box 6173, Orlando, Fla. 32803. Phone 305 339-5242.

TURF FARM MANAGER. You can earn between $16,000 and $22,000 a year, if you're alert to sound growing techniques, production-oriented and able to manage people effectively. Expansion of our bark business and related operations opens room for a turf manager with at least five years of practical experience on a turf farm. Inquiries will be kept strictly confidential. Please send your complete resume (including educational experience and references) to Donald Weyant, V.P., Gold Star Sod Farms, Inc., Canterbury, New Hampshire 03224.

HORTICULTURE SCIENCE Instructor — B.S. Degree in Horticulture, Agronomy or Botany required. Minimum 3 years industrial experience in turf management. Knowledge of Ag. Chemicals preferred. Applications accepted until August 1, 1976. Apply — Personnel Office, Hawkeye Institute of Technology, P.O. Box 8015, Waterloo, Iowa 50704. Phone 319 296-2320 Ext. 297, an equal opportunity employer.

TREE CARE SALES Fast growing, diversified landscaping-tree care firm looking for an experienced tree care salesman for sales of pruning, feeding, spraying, etc., to residential, commercial, and institutional customers. Send resume and salary requirements to: Theodore Brickman Co., Long Grove Road, Long Grove, Illinois 60047. An equal opportunity employer.

DEALERS WANTED

DEALERS WANTED for Texas, Louisiana, Ohio, Georgia and New York. For W.A.N.E. Tree System . . . a proven patented product in use throughout the U.S.A. A modest investment required. Write: W.A.N.E. Tree System, R1, Box 68, Tampa, Florida 33612.

WANTED TO BUY

COMPANY ENGAGED IN UTILITY or railroad right of way maintenance, (cutting, trimming, chemical). Would also consider purchase of partial interest. Box 152, Weeds Trees & Turf, Box 6951, Cleveland, Ohio 44101.

Advertisers

Adelphi Kentucky Bluegrass 33
Brouwer Turf Equipment Ltd. 23
Bunton Company/Goodall 54
Causco, Inc. 64
Ciba-Geigy 28, 29, 51
Howard S. Crane, Inc. 54
Crown Chemical Co. 48
Cushman Motors 55
Diamond Shamrock Chemical Company 16
Ditch-Witch Trenchers 50
Dow Chemical Company...2nd Cover
DuPont Company 10-11
Ford Tractor & Implement Operations 20-21
Gravely 56
HMC, Inc. 32
Hercules, Inc. 64, 66, 67, 68, 72
International Society of Arboriculture 61
Jacklin Seed Company 13, 65
Jacobsen Manufacturing Company .....3rd Cover
Johns-Manville 53
Kembro Company 52
Loft's Pedigreed Seed Company ..... 45, 4th Cover
Mallinckrodt Chemical Works 19
Ben Meadows Company 31
Mott Corporation 62
Northrup King & Company 63
Nursery Specialty Products 54
Princeton Manufacturing Company 52
Rain Bird Sprinkler Company 5
Rohm & Haas 49
Ryan Equipment 27
Strong Manufacturing Company ...67
Target Chemical Company 69, 70
TUCO, Division The Upjohn Company 6, 7, 57
Union Carbide Corporation 14-15
Velsicol Chemical Company 24-25
Wheel Horse 46, 47

Next Month

The August issue of WEEDS TREES & TURF will feature a report on the Oregon seed industry, a report on various herbicides presently on the market, how weed control is handled in Jacksonville, Fla., and a piece by Dr. Robert Schery of The Lawn Institute on various turf cultivars available to the turf manager today.

Trimmings

Over 50 percent of the trees planted in Milwaukee last year by the Forestry Bureau died because of vandalism, according to city forester Robert W. Skiera.

The city has approved $260,000 to allow the bureau to plant 4,000 trees this year with the provision the new trees have trunks 2½ to three inches in diameter. Skiera said the vandalized trees were about 1½ inches in diameter. He said the larger trees were expected to have a much higher survival rate. About 13,000 trees of the 1½ inch diameter size were planted last year.

Four $500 research grants will be awarded by the International Society of Arboriculture to support arboricultural research projects of direct interest to the tree care industry.

Application forms are available from Dr. E. B. Himelick, 383 Natural Resources Building, Urbana, Ill. 61801. Awarding of research grants will be judged by a review committee of ISA. Formal notice of awards will be made during the annual ISA meeting in St. Louis August 8-12.

Circle 114 on free information card

The Ohio Nurserymen's Association has accepted a request from the Lake County Nurserymen's Association to co-sponsor a black vine weevil research project. The program is udnerway at the Ohio Agricultural Research and Development Center in Wooster and is a three-year study costing $30,000.

The weevil occurs almost worldwide and is a major pest of Taxus, Azalea, Rhododendron, Ilex, Japanese maple and 200 other ornamentals. It appears populations of the insect are on an increase.

The insect attacks plants in the larvae stage eating the fibrous roots of the host. Young plants can be killed by just a few larvae. More mature plants can sustain a rather high population of larvae with little visible effect, but these plants often die when transplanted. The adult weevils feed on the foliage and make a characteristic crescent-shaped notch. A recent estimate says if no chemicals are used in Ohio that losses to the black vine weevil will be $24 million yearly.

Mike Nienaber of Mike Nienaber Advertising Agency, Bellevue, Wash., has been retained by the Washington State Nurserymen's Association as member service representative to assist in a number of capacities.

He will assist in solicitation of new members; advertisements for the montly newsletter; and advertisement for the convention directory. He will also supply executive secretary Honore Hacanson with written and photo material on the member nurseries and chapter meetings he visits around the state.

Nitrogen fertilizer may be in part responsible for the thinning of the earth's ozone layer, according to Harvard scientist Michael B. McElroy. Thus, fertilizer is placed in the recently noted infamous group along with aerosols and jet planes as serious treats to man's continued well-being.

Ozone is found in a layer about 20 miles above the surface of the earth. As sunlight penetrates the ozone layer, harmful ultraviolet rays are filtered out. Ultraviolet rays are thought to be responsible for skin cancer and they may have some effect on other animals, plants and the weather.

According to Professor McElroy, nitrogen fertilizer can ultimately result in the destruction of ozone. When nitrogen fertilizer is manufactured, some of the actual nitrogen is removed from the atmosphere. The fertilizer is the used for plant growth; some nitrogen compounds and organic matter remain in the soil; certain bacteria digest and denitrify the remains which releases the nitrogen back into the atmosphere. A small amount of this released nitrogen is in a form which reacts with the ozone. As more nitrogen fertilizers are used for crop production, there is a corresponding increase in the amount of destructive nitrogen released.

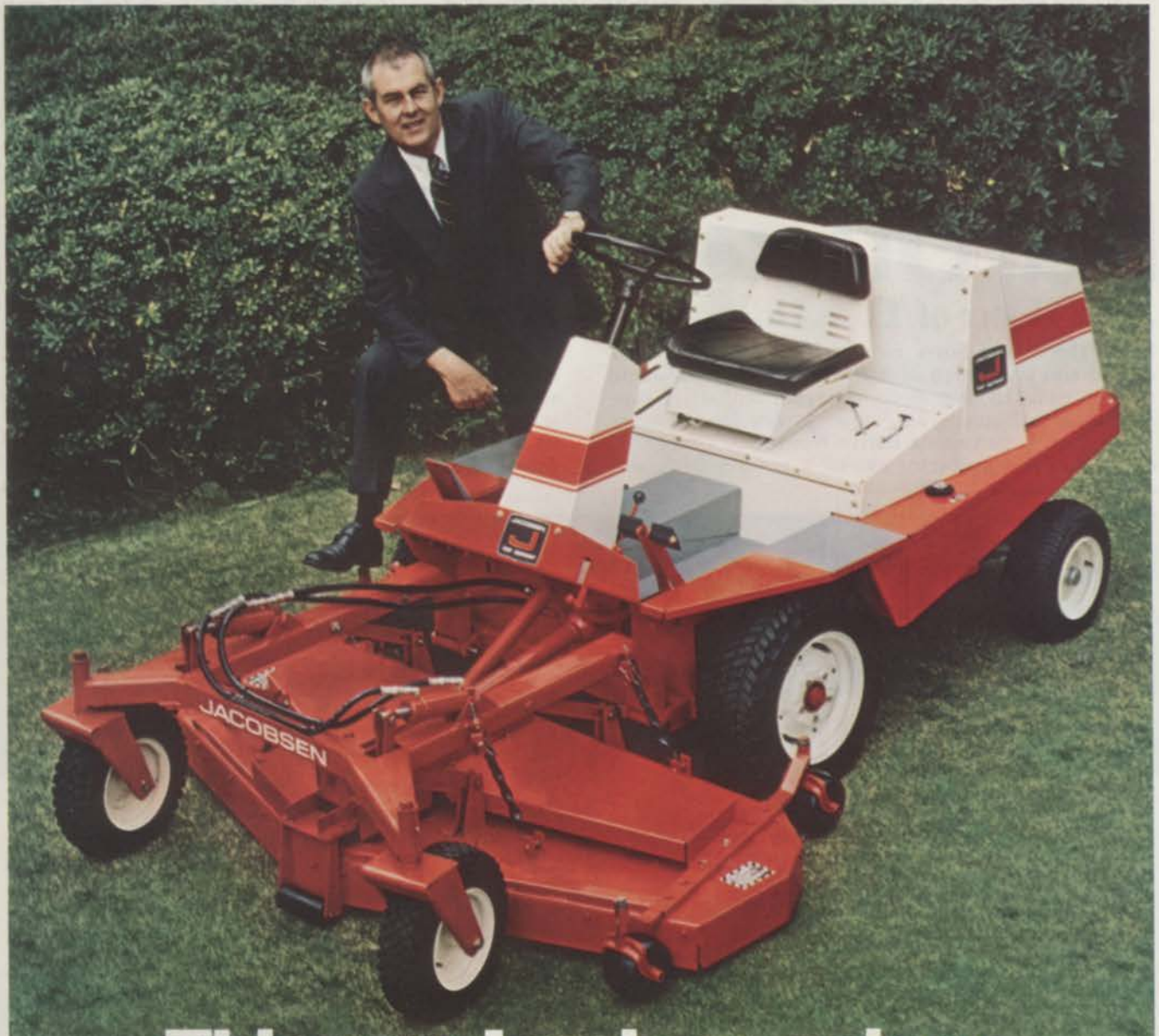
EPA Applicator Certification, A slide presentation designed to eliminate confusion regarding the federal law requiring certification of persons recommending or applying pesticides, is now available from Ciba-Geigy Corp.

The 20-slide series, accompanied by a study guide, explains objectives, benefits and requirements of the law and uses of restricted and non-restricted pesticides. For further information, contact the public relations department of the Agricultural Division, Ciba-Geigy Corp., P.O. Box 11422, Greensboro, N.C. 27409.

A new handbook, containing information on subjects developed by American Sod Producers Association legal counsel William Harding, is being sent to members, president Norman LeGrande has announced.

The handbook, punched for insertion in a three-ring, loose-leaf notebook so it can be easily filed, will be updated and new articles made available to the membership.

Current subjects included in the notebook are: Pension and Profit-Sharing Plans, Self-Employed Retirement Plans Versus Individual Retirement Accounts, The Applicability of Federal Motor Carrier Safety Regulations to Private Carriers, Wage and Hour Regulations for the Sod Industry, and Equal Employment Opportunity and the Sod Industry.



This new Jacobsen rotary mows, trims, mulches, sweeps, shovels and plows snow. Wow.

The good news in the picture is this brand new Jacobsen Out-front Commercial Rotary Mower.

Just ask Jim Walker of Outdoor Equipment Company in St. Louis about it. Like the rest of us, he's excited about this husky workhorse that can mow up to 30 acres a day.

He'll show you how it can climb curbs, trim around trees, and even perform a zero turning radius. He'll adjust the seat forward and backward for leg comfort.

He'll show how to mow up to 6 MPH, and then hydraulically raise the cutter deck and whip along at 14 MPH to another mowing site. And how the cutter deck tilts up and down for mowing gullies and bank edges.

That's not all. He'll show you how to attach the optional accessories like the leaf mulcher. Or the 60" snow plow. Or the 54" 2-stage snow thrower. Or the 60" rotary broom. And the protective cab for cold weather.

There are a lot more big features you'll want to know about. So you'd better ask your nearest Jacobsen distributor for an eye-popping demonstration.

It's the last word in out-front rotaries. And that word is "wow!"

Your Jacobsen Distributors

Great products deserve great service.

For the name of the distributor near you write: Jacobsen Turf Distributor Directory, 1721 Packard Avenue, Racine, Wisconsin 53403

Circle 134 on free information card

"One crew grows our sod, another crew lays it at the customer's home or place of business...Both crews have their own reasons for preferring baron* Kentucky Bluegrass."

John Hoerr of D. A. Hoerr & Sons, Peoria, Illinois.

D. A. Hoerr and Sons, Peoria, Ill., raises 500 acres of sod and lays much of it through their Landscape Contractual Division at commercial, industrial, municipal and homeowner sites. James Hoerr says: "Since we began using Baron Kentucky Bluegrass, we've had less problems raising a good quality sod and even fewer problems after the sod is laid. We can't just sell sod and hope for the best. We're responsible, even after installation. We find it pays to start with the very best seed we can buy. Baron gives us a well knit sod that takes root quickly, cutting down on service calls".

"When it comes to marketing sod, I can do it faster with Baron. John Hoerr says, "Baron's fast germination and quick development into mature sod shortens the time between planting and the day I sell my sod. In the sod growing business, that means money in our pockets."

"We use a blend of 3 bluegrasses with a minimum of 50% being Baron Kentucky Bluegrass. The other two varieties are Majestic and Merion. The high percentage of Baron insures us of what we consider to be our safety factor."

"Since we have been putting Baron in our mixture, we find the overall color holds up with less fertility. I use less fertilizer with Baron in the mixture than I have with any other bluegrass mixtures."

"All of our sod is mechanically harvested so it's important that root development is rapid and our sod holds together well. Baron lets us keep our fields clipped close and roots seem to knit well, giving us less hauling and handling problems. In our Landscape Contract and Maintenance Contract Servicing Departments, we know in advance complaints from the end user will be minimal."

If you're a sod grower, golf superintendent, or a professional landscape contractor, top quality turf is important to you. Lofts is ready to help with Baron, Majestic or Touchdown Kentucky Bluegrasses, Jamestown Chewings Fescue, Yorktown and Diplomat Ryegrasses as well as other varieties.

LOFTS

Lofts Pedigreed Seed, Inc.

Bound Brook, N.J. 08805 / (201) 356-8702

Lofts/New England	Great Western Seed Co.	Lofts/New York	Loft Kellogg Seed Co.	(Canadian Baron Dist.)
20 Beck Road	Box 387	4294 Albany St.	322 E. Florida St.	Oseco Limited
Arlington, Ma. 02174	Albany, Or. 97321	Albany, N.Y. 12205	Milwaukee, Wi. 53201	Box 219, Brampton
(617) 648-7550	(503) 926-2636	(518) 456-0042	(414) 276-0373	Ontario, Canada
				(416) 457-5080

*U.S. Plant Patent #3186, Dwarf Variety

Circle 146 on free information card